



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B 1,145,439

Serial No. 52

VK

981

A7

1916

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
H. LESTER JONES, Superintendent

FEEDS AND
MATERIALS
LIBRARY

INSIDE ROUTE PILOT

NEW YORK TO KEY WEST

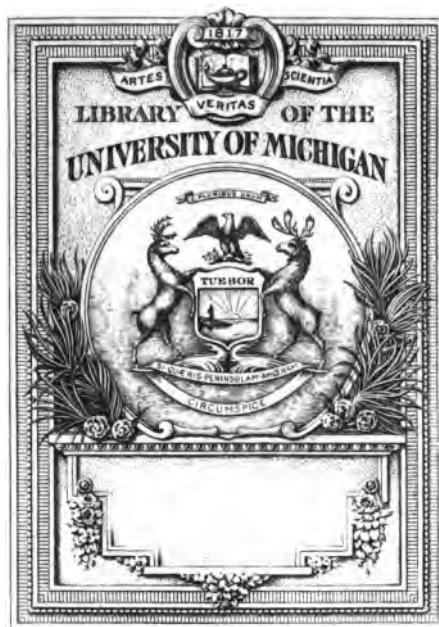
THIRD EDITION

1916

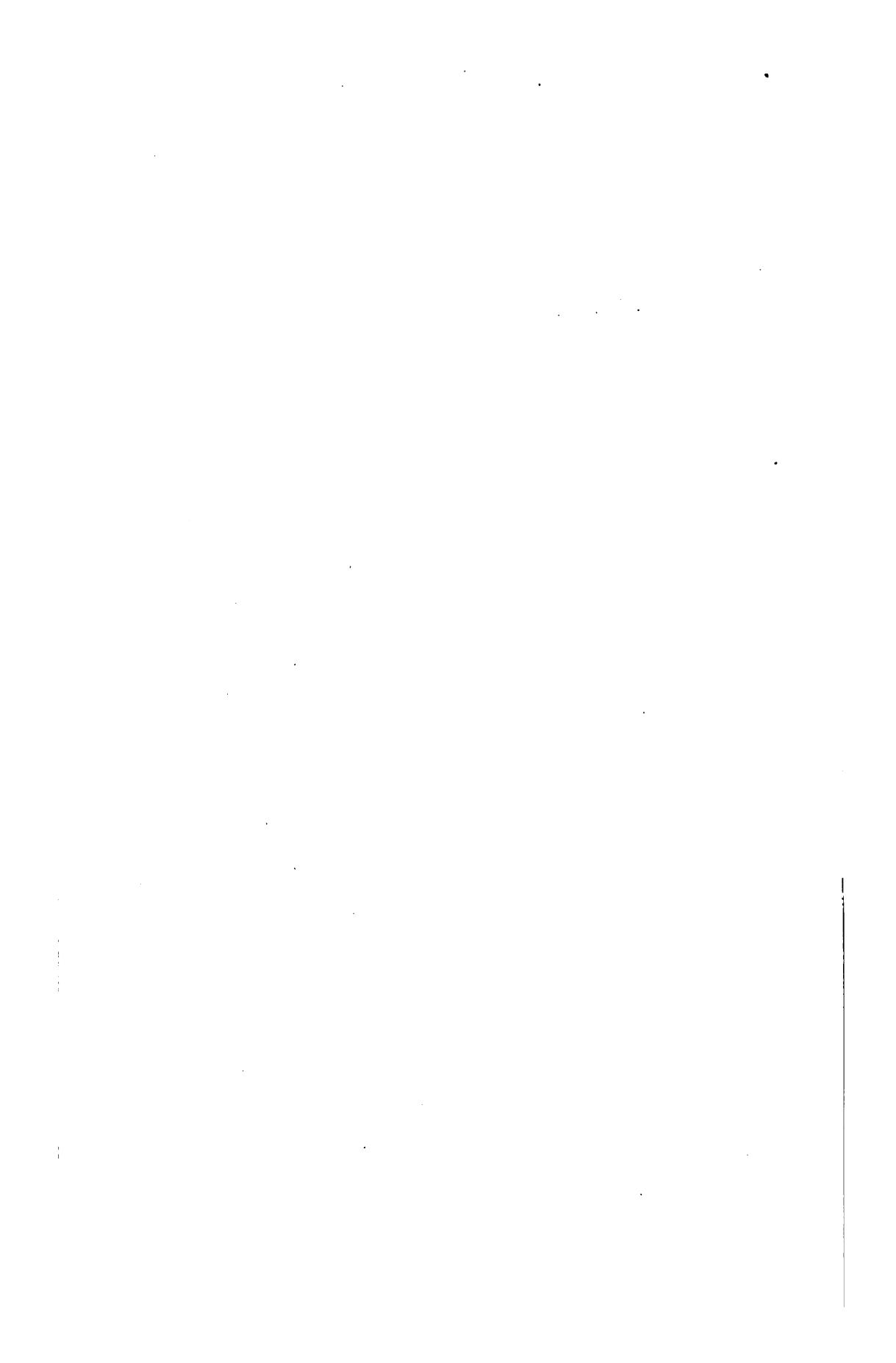


PRICE 20 CENTS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916



VK
981
A7
1916



34773
u58
C65i



Serial No. 52

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
E. LESTER JONES, Superintendent

INSIDE ROUTE PILOT

NEW YORK TO KEY WEST

THIRD EDITION

1916



PRICE 20 CENTS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

SUBOFFICES OF THE COAST AND GEODETIC SURVEY.

Boston, Mass., Bureau of Foreign and Domestic Commerce, customhouse.
New York, N. Y., room 403, customhouse.
New Orleans, La., 1020 Hibernia Bank Building.
Galveston, Tex., room 19, Cotton Exchange Building.
San Francisco, Cal., room 310, customhouse.
Seattle, Wash., room 204, Burke Building.
Manila, P. I., Intendencia Building.

At these offices complete files of United States Coast and Geodetic Survey charts, Coast Pilots, Tide Tables, and other publications relating to navigation may be consulted and information affecting navigation obtained without charge.

Light Lists, Buoy Lists, and Notices to Mariners are kept for free distribution to mariners.

The suboffices are also sales agencies for the Coast and Geodetic Survey publications.

A chart catalogue, giving lists of charts, coast pilots, tide tables, and agencies of the Coast and Geodetic Survey, can be obtained from any of the suboffices, or will be sent, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C. Frequent changes occur in the agencies, and the list of agencies is published in the first notice each month of the Notices to Mariners.

L. S. M. T. 1916

DEPARTMENT OF COMMERCE,
U. S. COAST AND GEODETIC SURVEY,
Washington, D. C., September 15, 1916.

This volume covers the inland water route from New York to Beaufort entrance and New River Inlet, N. C., the seacoast and inlets between Beaufort entrance and Winyah Bay, S. C., and the inland water route from Winyah Bay to Key West, Fla. It also includes directions for reaching the most important cities near the inland route, but does not cover the rivers and other waterways not necessarily traversed in making the through passage or in going to these cities, except that, when there are two practicable routes between the same points, both are described. Information concerning all navigable waters, including inland waters and the outside coast between New York and Norfolk, is published in Coast Pilot, section C, and from Norfolk to Key West in Coast Pilot, section D.

This publication is based upon surveys by the Coast and Geodetic Survey and United States Engineers, and a special examination by the Coast and Geodetic Survey in 1916. Great courtesy has been shown by the United States Engineers, the Lighthouse Service, and local authorities in furnishing information for the volume.

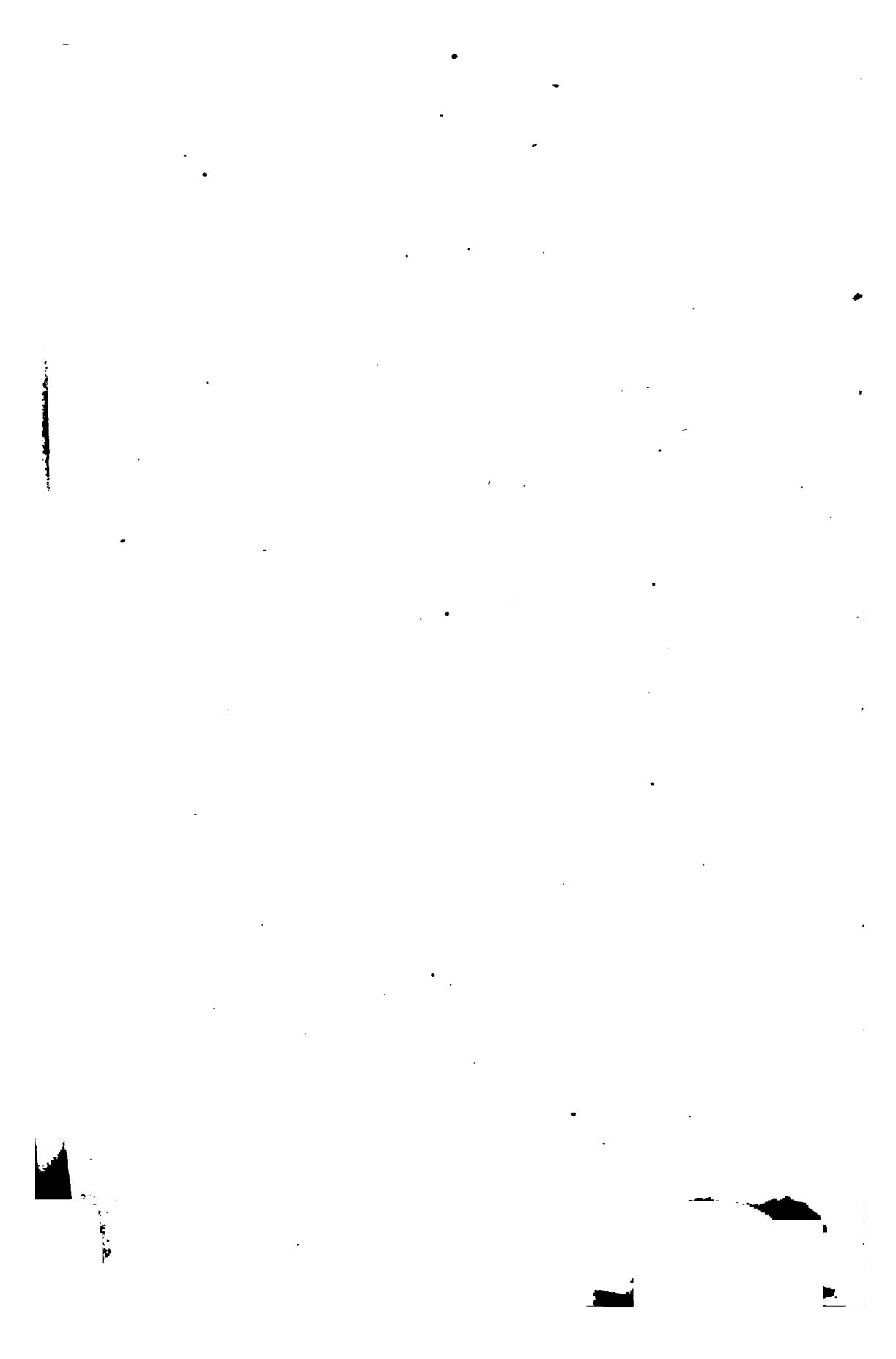
The first edition was prepared by Herbert C. Graves, nautical expert, and W. E. Parker, assistant; and the present (third) edition by L. A. Potter, assistant, under the direction of Herbert C. Graves, chief of Division of Hydrography and Topography, Coast and Geodetic Survey.

The accompanying charts show the through routes which are practicable for small vessels and are for the purpose of making the directions more easily understood. In the more open waters they are often a sufficient guide for small craft, but where the draft approaches closely the least depth larger scale charts should be used. The limits and numbers of the principal charts are shown on the accompanying charts, and a list of the most necessary charts is given at the end of this volume.

The aids to navigation are corrected to September 15, 1916.

Navigators are requested to notify the Superintendent of the Coast and Geodetic Survey of any errors or omissions they may find in this publication, or of additional matter which they think should be inserted for the information of mariners.

E. LESTER JONES,
Superintendent.



INSIDE ROUTE PILOT, NEW YORK TO KEY WEST.

Table of distances and drafts.

From—	To—	Distance in nautical miles.	Maximum draft in feet.
New York, N. Y.....	South Amboy, N. J.....	19	21
	New Brunswick, N. J.....	29	10
	Bordentown, N. J.....	68	7
	Philadelphia, Pa.....	93	7
Philadelphia, Pa.....	Delaware City, Del.....	35	9
	Chesapeake City, Md.....	47	9
	Baltimore entrance, Md.....	84	9
	Baltimore, Md.....	94	9
Baltimore entrance, Md.....	Annapolis entrance, Md.....	15	35
	Patuxent River, Md.....	55	35
	Cape Lookout, Potomac River.....	72	35
	Old Point Comfort, Va.....	138	35
Norfolk, Va.....	Norfolk, Va.....	148	35
	Elizabeth City, N. C.....	44	9
	Roanoke Marshes light, N. C. ^a	84	9
	Adams Creek, N. C. ^a	164	9
Morehead City, N. C.....	Beaufort or Morehead City, N. C. ^a	181	9
	Beaufort entrance, N. C. ^a	185	9
	Bogue Inlet, N. C.....	23	4
	Bear Inlet, N. C.....	27	4
Beaufort entrance, N. C. (out-side).	New River Inlet N. C.....	38	3
	Frying Pan Shoals, N. C.....	89	15
	Southport, N. C.....	117	15
	Winyah Bay, S. C.....	162	15
Winyah Bay, S. C.....	Georgetown, S. C.....	174	15
	Charleston, S. C.....	70	5
	Beaufort, S. C.....	75	9
	Savannah, Ga.....	118	9
St. Johns River, Fla.....	Brunswick, Ga.....	206	9
	Fernandina, Fla.....	231	9
	St. Johns River, Fla.....	256	9
	Jacksonville, Fla.....	274	9
St. Johns River, Fla.....	St. Augustine, Fla.....	34	5
	Daytona, Fla.....	80	4
	Mosquito Inlet, Fla.....	91	4
	New Smyrna, Fla.....	9	4
Miami, Fla.....	Titusville, Fla.....	125	4
	Cocoa, Fla.....	141	4
	Eau Gallie, Fla.....	156	4
	Fort Pierce, Fla.....	201	4
Miami, Fla.....	St. Lucie Inlet, Fla.....	220	4
	Jupiter Inlet, Fla.....	235	4
	West Palm Beach, Fla.....	250	4
	New River, Inlet, Fla.....	287	4
Miami, Fla.....	Fort Lauderdale, Fla.....	289	4
	Miami, Fla.....	310	4
	Bahia Honda Harbor, Fla. (northward of keys).	100	5
	Key West (through Hawk Channel from Bahia Honda).	133	5
Miami, Fla.....	Key West (through Gulf of Mexico from Bahia Honda).	149	5

^a Distances are via Dismal Swamp Canal route. For distances via Albemarle and Chesapeake Canal route subtract 3 miles.

^b These drafts can be carried only by taking advantage of the tide.

Note.—The courses and bearings given in degrees are *true*, reading clockwise from 0° at north to 360° , and are followed by the equivalent *magnetic* value in points in parentheses. General directions, such as northeastward, west-southwestward, etc., are magnetic.

Distances are in *nautical miles*, and may be converted approximately to statute miles by adding 15 per cent to the distances given. Currents are expressed in knots, which are nautical miles per hour. Except where otherwise stated, all depths are at *mean low water*.

INSIDE ROUTE, NEW YORK TO NORFOLK.

From New York Upper Bay the generally used passage is through Kill van Kull and Arthur Kill, and thence around Great Beds lighthouse to the entrance of Raritan River; but strangers frequently take the more open passage through New York Lower Bay and Raritan Bay to Raritan River. Thence the passage leads up Raritan River to New Brunswick, and thence through the Delaware & Raritan Canal to Bordentown. Thence down Delaware River to Delaware City, and thence through the Chesapeake & Delaware Canal to Chesapeake City. Thence down Back Creek and Elk River to the head of Chesapeake Bay at Turkey Point and thence down Chesapeake Bay and through Hampton Roads and Elizabeth River to Norfolk.

A draft of 7 feet can be taken through the passage from New York Bay to Delaware Bay, and 9 feet from Delaware Bay to Chesapeake Bay, and these are the limiting drafts. The greatest speed permitted in the canals is $4\frac{1}{2}$ statute miles per hour. A vessel with a speed of 10 miles, running in daytime only, can make the passage in three and one-half to four days under favorable conditions. It is advisable to inquire beforehand whether the Delaware & Raritan Canal is open for navigation.

Supplies.—Coal in limited quantities can be obtained at numerous places, but the best and most convenient coaling places are Perth Amboy, Philadelphia, Baltimore, and Norfolk. Gasoline, provisions, and water can be obtained at any of the towns or cities along the route.

Pilots can be obtained on inquiring at Perth Amboy, New Brunswick, Bordentown, Delaware City, Chesapeake City, and Baltimore for either the whole or parts of the passage. A fisherman or pilot may sometimes be obtained at the mouth of Back Creek competent to pilot a vessel to Chesapeake City. The fees are not prescribed by law.

Ice sufficient to interfere with the navigation of small craft may be expected at any time between December and April, and is most severe during January and February. The canals are kept open as long as navigation is possible, and are opened as soon as navigation is possible in the spring. During mild winters local vessels use them throughout most of the winter, but strangers should make inquiries about their condition before attempting the passage.

KILL VAN KULL AND ARTHUR KILL.

These passages have a combined length of 17 miles from Robbins Reef lighthouse to Ward Point, the southern end of Staten Island, and a width varying from 600 yards to less than 200 yards. There is considerable shipping, especially through Kill van Kull. Strangers should have no difficulty in making the passage with a draft of 10 feet, with the aid of the chart and the directions. The Baltimore & Ohio Railroad crosses Arthur Kill about $\frac{1}{2}$ mile southward of Elizabethport. There is a clear width of 202 feet on each side of the

center pier of the draw; the eastern channel has the deeper water and is generally used.

Anchorage is not permitted in the channel of Kill van Kull and Arthur Kill, anchorage limits being prescribed by regulation. The anchorage on the western side of Arthur Kill off Perth Amboy is good and convenient; its eastern limit is a line running northward from the horizontally striped buoy to the Lehigh Valley coal docks.

Tides.—The mean rise and fall of the tides at Shooters Island is 4.6 feet; high water occurs 17 minutes later than at Governors Island. At South Amboy the mean rise and fall is 5.3 feet, and high water occurs 8 minutes later than at Sandy Hook.

RARITAN RIVER.

has a length of 10½ miles from South Amboy to New Brunswick, a width varying from ½ mile to 125 yards, and is crooked in places. Dredging has been done to obtain a channel 200 feet wide and 10 feet deep to a point ¼ mile above the mouth of South River, and thence 100 feet wide with the same depth to New Brunswick. At high water the marshy banks are generally covered, making it difficult for a stranger to follow the channel. Two drawbridges cross the river near its entrance at South Amboy.

New Brunswick is an important city at the entrance to the Delaware & Raritan Canal from Raritan River. The canal forms a basin abreast the city, which is the harbor of New Brunswick. At high water of spring tides a draft of 8 feet has been taken into the basin through the entrance lock of the canal, but 7 feet is the deepest draft for which the canal company will be responsible. The size of vessels entering the basin is limited to the size of the canal lock. Coal, water, and provisions can be had in the basin.

Sailing vessels, which are not going to tow down the Raritan River, are advised to remain in the basin at New Brunswick until the wind serves for them to sail down the river. There is no place for some distance below New Brunswick at which a vessel of 7 feet draft can make fast outside of the basin without lying aground at low water, and the river channel is too narrow for vessels to anchor.

Towboats.—A towboat can be obtained at Perth Amboy and South Amboy and sometimes at New Brunswick, and can always be had at New Brunswick by telephoning to Perth Amboy.

Tides.—At New Brunswick high water is 49 minutes later and low water 1 hour 33 minutes later than at Sandy Hook; the mean rise and fall of tides is 6 feet.

DELAWARE & RARITAN CANAL.

This canal is 38 miles long from its eastern entrance at New Brunswick on the Raritan River to its western entrance at Bordentown on the Delaware River. The principal places on the canal and their distances, in miles, from New Brunswick are: Bound Brook, 7; Millstone, 12; Kingston, 21; Trenton (Coalport Basin), 32; Bordentown, 38. There are 13 locks in the canal, the dimensions of which are 210 feet long, 23 feet 4 inches wide, and 7 feet deep. The deepest draft permitted through the canal is 7 feet. Masted vessels are limited to masts less than 50 feet above canal level by the arched stone bridge at

New Brunswick, which has a clear height of 50 feet in the middle. Coal in limited quantities may be obtained from local dealers at the principal places on the canal, but steamers will find it more convenient to coal at Perth Amboy and Philadelphia than along the canal. The water in the canal is fresh, but is not good for drinking purposes.

Toll rates, which are subject to change, are charged by the canal company and are collected at the entrance where the vessel is given clearance. Towage through the canal can be arranged at either entrance.

The following information is taken from the **Rules and Regulations Governing the Delaware & Raritan Canal**, published by the company, and which will be furnished by them at the canal entrance on application:

When under way at night, a small green signal light shall be carried on the stem; a steamer shall carry in addition a white light at the end of her flagstaff, or if towing other boats two white lights at the end of her flagstaff; no other lights or reflectors shall be carried. No vessel shall carry sail in the canal. The speed shall not exceed 4½ miles (statute) per hour. When a vessel overtakes another, the slower shall give the inner track to the faster, unless within 300 yards of a lock or bridge. When in danger of meeting at a bridge or where both can not pass, the one going westward shall lie to. Everything towed by horses or mules, and rafts, on meeting steamboats shall keep on the side next the towpath; in all other cases, everything meeting shall keep to the right. When approaching a lock or bridge, notice shall be given on arriving within 300 yards of the same by a horn, bell, or whistle. Steamboats passing other boats or vessels, either in motion or at stopping places, shall "slow-up" till entirely past, especially in passing Coalport. Steamboats must not check headway by backing while in the locks, nor blow out their boilers while passing locks or bridges. The signal at night that a lock is ready will be two whistles from the lock engine for boats bound west and four for those bound east. No stones, rubbish, dead carcasses, or other offensive matter shall be thrown or dropped into the water.

DELAWARE RIVER, FROM BORDENTOWN TO DELAWARE CITY.

The distance is 60 miles from Bordentown to Delaware City, and the channel generally has ample width and is easily followed; but extra caution is required in the first ½ mile from Bordentown, where there is a depth of 7½ feet in a narrow channel. This is the shoalest place in the channel. Channels have been dredged 12 feet deep and 200 feet wide from Philadelphia to Trenton, and 30 feet deep and 800 to 1,200 feet wide from Delaware Bay entrance to Philadelphia. Many of the shoals in the river are bare at or before low water, and are generally covered with marsh grass, which makes them usually well defined. The water in the river above Chester is fresh and suitable for boilers; above Bristol the water is ordinarily suitable for drinking purposes, except in dry seasons.

Coal can be obtained at Philadelphia, either at the wharves or by lighters; it can also be obtained at Chester and New Castle and in limited quantities at Delaware City, but the facilities are not so good as at Philadelphia.

Anchorage.—Except for $\frac{1}{2}$ mile below Bordentown, there is a sufficient width at most places in the channel for anchorage, for which the chart must be the guide. The anchorage limits at Philadelphia are prescribed by regulation. Below Marcus Hook suitable anchorage may be selected off the ranges.

Delaware City, at the entrance of the Chesapeake & Delaware Canal from Delaware River, has little commerce except that passing through the canal. Provisions and gasoline may be obtained. The wharves have a depth of 8 to 9 feet in Delaware River at their ends. There is a depth of 9 feet on the northern side at the entrance to the canal lock, and vessels usually lie here when waiting to lock in.

Tides.—The mean rise and fall of tides at Bordentown is 4.7 feet; Burlington, 5.4; Philadelphia, 5.3; Chester, 5.8; and Delaware City, 5.9. High water occurs at Bordentown 2 hours 25 minutes, and at Burlington 1 hour 32 minutes later than at Philadelphia, and at Chester 1 hour 24 minutes, and at Delaware City 2 hours 53 minutes earlier than at Philadelphia.

CHESAPEAKE & DELAWARE CANAL.

This canal is 12 miles long from its eastern entrance at Delaware City, on Delaware Bay, to its western entrance at Chesapeake City, on Back Creek. There are three locks in the canal, the dimensions of which are 220 feet long, 24 feet wide, and 9 feet deep. The deepest draft permitted through the canal is 9 feet. All bridges over the canal have draws. The water in the canal is fresh, but is not suitable for drinking purposes. Toll rates, which are subject to change, are charged by the company, and are collected at the entrance, where a pass bill is given the vessel. Towage through the canal can be arranged at either entrance. Strangers passing through this canal are advised to inquire at the entrance whether there are any shoal places which require attention. The canal is closed from 9 a. m. to 5 p. m. on Sundays.

The following information is taken from the **Regulations Governing the Chesapeake & Delaware Canal**, published by the company, and which will be furnished by them at the canal entrance on application:

The pass bill must be shown to each lock keeper before passing through. No vessel shall carry sail in the canal, nor shall the speed exceed $4\frac{1}{2}$ miles (statute) per hour. Vessels passing shall keep to the right, but shall give the inner track to vessels in tow of horses or mules. Masted vessels when meeting unmasted boats shall take the outer track. Rafts shall always keep the outer track. When a vessel overtakes another, the slower shall give the inner track to the faster, unless within 300 yards of a lock or bridge. When approaching a lock or bridge, notice shall be given on arriving within 300 yards of the same by a horn or bell. When passing through at night a light shall be carried on the bow. Vessels lying in the canal at night shall carry a light on the bow and at the stern. No earth, stone, timber, or other material shall be placed or put in the canal.

BACK CREEK AND ELK RIVER.

Back Creek has a length of $3\frac{1}{4}$ miles from Chesapeake City to Elk River. The channel is crooked and narrow, with shoals on both sides, but is marked by buoys. The deepest draft using the creek



is 9 feet. For a distance of $1\frac{3}{4}$ miles below Chesapeake City the depth is 9 feet or over in a channel 120 to 150 feet wide, and below that point to the entrance the channel has a width of 200 to 400 feet. A pilot may be obtained on inquiry at Chesapeake City or the entrance to the creek. The channel in the creek is too narrow for anchorage. Gasoline and provisions are obtainable at Chesapeake City, and there is a shipyard and marine railway.

Elk River has a length of nearly 8 miles from Back Creek to the entrance of the river at Turkey Point. The channel is wide and easily followed.

Tides.—In Back Creek high water occurs about 2 hours 20 minutes after high water at Baltimore, and the mean rise and fall of tides is 2.6 feet.

CHESAPEAKE BAY.

The channel in Chesapeake Bay is well marked and easily followed by the class of vessels using the inland waterway. Coal, gasoline, repairs, and supplies of all kinds can be best obtained at Baltimore and Norfolk. Some supplies and gasoline can be had at numerous places on the tributaries of the bay, the best places near the sailing route being Annapolis, Solomons on the Patuxent River, and Cockrells Creek (Reedville) on the Great Wicomico River. There are small marine railways at Annapolis, Solomons, Reedville, and Carter Creek on the Rappahannock River. Anchorage can be had at numerous places on the shores of the bay and its tributaries, depending on the direction of the wind. Those most frequently used and easiest of access are:

Severn River, at Annapolis in the mouth of Spa Creek, depth 13 feet; also in Annapolis Roads southeastward of Greenbury Point Shoal lighthouse.

Patuxent River.—Small vessels usually anchor on the north side, between Drum Point lighthouse and the horizontally striped buoy $\frac{5}{8}$ mile westward of the lighthouse, and small craft frequently anchor in the cove on the north side of Solomons Island ($1\frac{5}{8}$ miles westward of Drum Point lighthouse).

Cornfield Harbor, on the west side of Point Lookout, entrance of Potomac River, is occasionally used; it is sheltered only from northerly and northeasterly winds.

Great Wicomico River and the mouth of Cockrell Creek is a good and convenient harbor. The fish stakes off the entrance may give trouble at times to vessels entering. The depths at the anchorage are 15 to 20 feet.

Rappahannock River.—Anchorage, exposed to southeasterly winds, can be selected in the entrance.

Mobjack Bay is exposed to southerly and southeasterly winds, and except toward its head or in the arms it is exposed to northwest winds also.

Hampton Roads.—Small craft usually anchor in what is locally known at Mother Hawkins Hole, on the north side of the eastern part of Hampton Bar; the entrance is between the wharf at Old Point Comfort and the horizontally striped buoy close westward of it. Small craft usually seek shelter in Hampton Creek in bad weather.

Small vessels frequently anchor on the northerly part of Craney Island Flats westward of the dredged channel leading to Norfolk;

also on the shoals eastward of that channel between the Virginian Railroad pier and Bush Bluff light vessel.

Tides.—The mean rise and fall of tides at Baltimore is 1.2 feet; Rappahannock River entrance, 1.2; Old Point Comfort, 2.5; and Norfolk, 2.8.

DIRECTIONS, INSIDE ROUTE, NEW YORK TO NORFOLK.

These directions are good in the daytime for a draft of 7 feet to Philadelphia, and for a draft of 9 feet from Philadelphia to Chesapeake Bay. Strangers are advised not to run at night.

The directions in Chesapeake Bay are intended for vessels of 9 feet or less draft that use the inland route, but are good for vessels of greater draft in most places. With westerly winds small vessels can follow with advantage the western shore more closely, being guided by the chart, but care should be taken at night to avoid the fish traps which extend long distances from shore in places, especially on the shoals between Great Wicomico River and Old Point Comfort.

Through Kill van Kull and Arthur Kill to South Amboy, 19 miles.—Enter Kill van Kull between Robbins Reef lighthouse and the north end of Staten Island, giving the lighthouse a berth of 600 yards and the shore of Staten Island a berth of 300 yards, and follow a mid-channel course for about $2\frac{1}{2}$ miles from Constable Point. Then pass about 100 yards southward of the red buoy eastward of Bergen Point lighthouse, and pass 220 yards south of the lighthouse.

Then steer 267° true (W $5\frac{3}{8}$ N mag.) and pass about 75 yards southward of the wharves on the southern side of Shooters Island (which will be recognized by the ruins of the shipyard on it). When the western end of Shooters Island is abeam, steer about 308° true (NW $1\frac{1}{4}$ N Mag.) for $\frac{1}{4}$ mile to a position a little southward of a horizontally striped buoy, then a more westerly course for $\frac{1}{4}$ mile, leaving a black buoy on the port hand and a horizontally striped buoy on the starboard hand.

Then steer about 269° true (W $3\frac{3}{4}$ N mag.), leaving a red buoy on the starboard hand, and then follow a mid-channel course past Elizabethport. Vessels of 7 feet draft can pass through either of the wide openings of the railroad drawbridge southward of Elizabethport, although the eastern opening has the deeper water. When $\frac{1}{2}$ mile southward of the bridge, steer 185° true (S by W $1\frac{1}{4}$ mag.), and pass in mid-channel eastward of Buckwheat Island (small and grassy) and westward of Pralls Island, following a general mid-channel course.

From the southern end of Pralls Island follow the western bank at a distance of about 150 yards, except for a distance of $\frac{3}{8}$ mile northward of Tufts Point, where that bank should be given a berth of 200 yards. Pass about 150 yards southward of Tufts Point, steer about 270° true (W $7\frac{3}{8}$ N mag.), and pass about 150 yards northward of Smoking Point. Then follow the northwestern bank at a distance of about 300 yards, passing northward and westward of the white anchorage buoys and the red buoy at Storys Flats. When past the latter buoy follow the western bank at a distance of 200 yards to Perth Amboy. Anchorage can be had on the western side of the channel at Perth Amboy.

Pass 100 yards eastward of the horizontally striped buoy off Perth Amboy, steer about 153° true (S by E $5\frac{1}{2}$ E mag.), and pass 100 yards westward of Ward Point, and eastward of the horizontally striped buoy southward of the point. Pass 200 yards eastward and southward of Great Beds lighthouse, and steer 268° true (W $5\frac{1}{2}$ N mag.) for black buoy No. 9. Pass about 100 feet northward of this buoy and steer 303° true (NW $1\frac{1}{2}$ W mag.), heading for the left draw in the railroad bridge. Anchorage can be had on the north side of the channel, northward of a line joining the anchorage buoys and the center pier of the drawbridge.

New York Lower Bay and Raritan Bay to South Amboy.—Pass eastward and southward of the black bell buoy lying $\frac{3}{4}$ mile northward of West Bank lighthouse, and steer 239° true (WSW $1\frac{1}{2}$ W mag.) for $7\frac{1}{2}$ miles, passing $\frac{1}{2}$ mile northward of West Bank and Old Orchard Shoal lighthouses, passing southward of Old Orchard Shoal red buoy and to a position $\frac{1}{4}$ mile northward of Conaskonk Point Shoal buoy No. 3. Then steer 269° true (W $\frac{3}{4}$ N mag.) for $3\frac{1}{4}$ miles, passing between buoys Nos. 7 and 8 to a position 200 yards southward of Great Beds lighthouse as in the preceding paragraph.

Raritan River to New Brunswick, $10\frac{1}{2}$ miles.—Except at high water, when the marshy banks are covered in places, vessels of 7 feet or less draft, with the aid of the chart, should have no difficulty in going up the Raritan River to New Brunswick.

From the railroad drawbridge at South Amboy pass about 200 feet off Sandy Point, and then go through the draw in the second bridge. Then follow the northern bank, giving the ends of the wharves a berth of 200 to 300 feet, to light No. 1, which is on the lower end of a dike on the northwestern side. Follow this dike and the northwest bank above it at a distance of 200 feet until above the opening in the dike on the southeast side of the channel $\frac{1}{2}$ mile above light No. 2. Then keep in mid-channel as defined by the dikes until $\frac{1}{4}$ mile above light No. 3, and then pass the point on the north bank, lying opposite the western end of the dike on the southern side, at a distance of 200 feet.

In making the bend around Crab Island follow the dike on the northwest side of the channel at a distance of 300 feet. Then cross over and follow the eastern and southern bank, at a distance of 200 feet, past Sayreville and the canal leading to Washington. From the canal entrance keep in mid-channel northward through Long Reach for a distance of $\frac{1}{4}$ mile, and then gradually favor the eastern bank and follow it at a distance of 125 feet in the northern part of this reach. When the river begins to bend northwestward, edge out gradually to mid-channel, and so continue around the bend until approaching the entrance of South River.

Then favor the southern bank past the entrance of South River and the dock $\frac{1}{4}$ mile westward. When past this dock, edge over gradually and favor the eastern bank northward through Rocky Reach. When the river begins to bend northwestward, edge out gradually to mid-channel, and so continue around the bend to Lawrence Creek (on southern bank) and also in the next reach northwestward to Martins Landing.

There is a stone dock on the north bank 400 yards westward of Martins Landing; favor the north bank between them until 300

yards westward of the stone dock, and then keep in mid-river around the next bend until up with the rocky bluff on the southern bank. Then favor well the southern bank to the lock at New Brunswick.

Delaware River from Bordentown to Delaware City, 60 miles.—A stranger, proceeding with caution in the narrow parts of the river and using the lead, should have little difficulty in making the passage from Bordentown to Delaware City with the aid of the chart and the directions. Extra caution is required in the first $\frac{1}{2}$ mile below Bordentown.

Bordentown to Florence.—On leaving the lock at Bordentown, head so as to pass about 125 feet westward of the steamboat wharf on the east bank just south of the entrance to the creek, and then head about 214° true (SW $\frac{1}{8}$ S mag.), with Bordentown range front light (white post), on the south bank $\frac{3}{8}$ mile distant, a little on the starboard bow. Leave a black buoy 50 feet on the starboard hand, and then haul westward so as to follow the curve of the channel, and pass about midway between the light and a horizontally striped buoy.

When below Bordentown range front light steer 229° true (SW by W $\frac{1}{8}$ W mag.), following at first the southeastern bank at a distance of 100 yards, to a mid-channel position 600 yards above Newbold Island. Then haul westward gradually, giving the northern bank a berth of over 150 yards, and pass in mid-channel northward of Newbold Island until past Penn Manor light; this light is on the north bank westward of a small wharf.

Bring this light astern on a 228° true (SW by W $\frac{1}{8}$ W mag.) course, heading for Kinkora light and passing between the buoys which mark the channel at Kinkora Bar; Kinkora light may be seen well to the left of a sand wharf. When abreast the clubhouse wharf haul a little westward, following the buoys to abreast the sand wharf, pass about 150 yards northward of it, and then follow the southern bank at a distance of 150 yards to Florence (large pipe works).

Florence to Torresdale.—Keep in mid-channel in making the bend northward of Florence and then follow the western bank at a distance of 150 yards, drawing in to 100 yards from that bank from the northern end of the pipe foundry above Bristol to abreast the yacht club wharf $\frac{3}{8}$ mile below. Then follow a mid-channel course between Burlington Island and Bristol, and when up with the ferry landing (Bristol) bring it astern on a 206° true (SW $\frac{7}{8}$ S mag.) course and pass 75 to 100 yards westward of a red buoy off the lower end of Burlington Island.

Favor, if anything, the southern bank in passing Burlington until abreast the large foundry at its western end, and then steer 258° true (W $\frac{1}{4}$ S mag.) for College Point light (northern bank) until $\frac{1}{4}$ mile from it, and pass it at a distance of 200 yards. Then steer 250° true (W by S mag.) for the standpipe in the town of Beverly (southern bank); the black buoy near Beverly should be nearly ahead. Pass about 200 feet southward of this buoy and 300 feet off the northerly wharves of Beverly on a 282° true (WNW $\frac{1}{4}$ W mag.) course, with an old wharf on the northern bank a little on the starboard bow.

Pass 150 yards southeastward of this wharf, and steer 239° true (WSW mag.) with the wharf at Torresdale a little on the starboard bow and a concrete tower and high chimney a little on the port bow, to the entrance of the dredged channel leading past Mud Island.

Pass through the dredged channel on a 236° true (SW by W $\frac{3}{4}$ W mag.) course, with a lighted range astern, being guided by the buoys and heading for the high chimney, and continue this course to a position 275 yards southeastward of the wharf at Torresdale (marked by Torresdale light).

Torresdale to Philadelphia.—Follow the west bank at a distance of 200 yards to the southern end of Torresdale, then steer 222° true (SW $\frac{1}{2}$ W mag.) with the prominent clubhouse and flagstaff on the end of the pier at Riverton a little on the port bow; Riverton light is also on the end of the pier. On this course pass about 100 yards southeastward of the two black spar buoys which lie near the northwestern bank $\frac{3}{4}$ and 1 mile below Torresdale, and about 200 yards northwestward of the red spar buoy which lies near mid-river, $1\frac{1}{2}$ miles below Torresdale.

Pass 200 yards north of Riverton light (end of pier), and bring the light astern on a 262° true (W $\frac{1}{8}$ N mag.) course; on this course pass 150 yards north of the red spar buoy 1 mile westward of Riverton. Then follow the western bank at a distance of about 300 yards and pass 150 yards westward of buoy No. 2 off Bridesburg. Then steer 202° true (SSW $\frac{3}{4}$ W mag.) for the draw (draw is 50 feet above high water), and when through the bridge follow a mid-river course in passing Philadelphia. Anchorage can be made on the eastern side of the river, either at Petty Island, 2 miles below the bridge, or from Kaighns Point to Gloucester, 5 to 7 miles below the bridge.

Philadelphia to Chester.—Keep in mid-river in passing Philadelphia, and when up with the ferry landing at Gloucester steer 206° true (SW by S mag.) about 1 mile on the Horseshoe east group upper range (ahead). Pass about 200 yards eastward of gas buoy No. 37, and steer 240° true (WSW $\frac{1}{8}$ W mag.) on the Eagle Point range (ahead).

Pass about 200 yards northward of buoy No. 46 and steer 274° true (WNW $\frac{7}{8}$ W mag.) about $1\frac{1}{8}$ miles, and when up with buoy No. 44 haul southward and pass about 200 yards westward of it. Then steer 234° true (SW by W $\frac{1}{2}$ W mag.) on the Fort Mifflin Bar range (may be seen over the ferry landing ahead); this course follows the northern bank at a distance of about 300 yards, passes about 300 yards westward of a ruined pier (with white daymark) near mid-river, and leads north of a red buoy and south of a black buoy.

Then steer 250° true (W by S mag.) for $1\frac{1}{4}$ miles, giving the southern bank a berth of about 300 yards, to a position 100 yards northward of a red nun buoy. Then steer 272° true (W $\frac{7}{8}$ N mag.), keeping the Tinicum Island range astern, and pass about midway between the buoys off the western end of Tinicum Island. When gas buoy No. 2T is on the port beam distant 300 yards, steer 230° true (SW by W $\frac{1}{8}$ W mag.) with the Chester range astern to the red gas buoy off the south end of Chester.

Chester to Delaware City.—From the red gas buoy steer 237° true (SW by W $\frac{3}{4}$ W mag.) on the Marcus Hook range for $4\frac{1}{4}$ miles, passing between the buoys which mark the edges of the channel. When Grubbs Landing light (crib in water) is nearly abeam, steer 215° true (SW $\frac{1}{8}$ S mag.) nearly 3 miles on the Bellevue range which is ahead.

When abreast of Edgemoor Rolling Mill and buoy No. 2B is on the port beam, steer 197° true (SSW $\frac{1}{4}$ W mag.) for $4\frac{3}{4}$ miles

with the Cherry Island range astern until at the intersection with the Deepwater Point range and abreast gas and bell buoys No. 2C. Then steer 234° true (SW by W $\frac{1}{2}$ W mag.) for $3\frac{1}{2}$ miles, passing about 300 yards eastward of black buoy No. 27 and the same distance westward of the horizontally striped buoy at the northeastern end of Bulkhead Shoal; red spar buoy No. 6 should be on the port bow, and as it is approached should be left 200 yards on the port hand.

When abreast of red spar buoy No. 6, steer about 195° true (SSW mag.) for $1\frac{1}{2}$ miles, and leave two black spar buoys 350 yards on the starboard hand.

Then haul southward, pass 200 yards westward of gas buoy No. 4, and steer 148° true (SSE $\frac{1}{8}$ E mag.) about $1\frac{1}{2}$ miles to a position about 300 yards off the wharves at Delaware City. Anchorage may be made on the eastern side of the channel, about $\frac{1}{4}$ mile off the wharves, in 15 to 17 feet. If going into the canal, whistle when $\frac{1}{4}$ to $\frac{1}{2}$ mile away and slow down. The entrance lock is on the south side of the southernmost wharf, and vessels make fast to the wharf, on the starboard side at the entrance to the lock, until the lock is open and ready to enter. The current in the river setting past the ends of the wharves must be considered and allowed for when turning in for the canal wharf.

Through Back Creek and Elk River to Turkey Point, 11 miles.—A stranger should proceed slowly in Back Creek, and keep the leads going on both sides, as the slope on either side is sufficient to make the difference in depth, obtained with the two leads, a warning of the approach to the flats. Vessels must slow down when passing other vessels. The buoys are in a depth of 6 feet on the edges of the channel.

From the lock at Chesapeake City favor the northern bank for a distance of $\frac{3}{8}$ mile, leaving buoy No. 8 on the port hand, and buoy No. 7 on the starboard hand, at a distance of 25 yards. When past the latter buoy keep near the middle of the creek until approaching the next point on the southern bank, and pass 50 yards northward of it. Then steer 285° true (WNW mag.) and leave the end of a wharf at the entrance of Long Creek 50 feet on the starboard hand and buoy No. 5, just below, about 25 yards on the starboard hand. Then follow mid-creek, leave buoy No. 6 about 25 yards on the port hand, and then pass 50 yards northward of the next point on the south bank (marked by the ruins of a wharf).

Emilys Point, the next point on the north bank, should be passed at a distance of 60 yards, and the next point $\frac{1}{8}$ mile below on the south bank should be passed at the same distance. Then steer for a position in mid-creek a little westward of the marshy opening on the north bank, and then steer 271° true (W $\frac{3}{4}$ N mag.) for $\frac{1}{4}$ mile to a position 100 yards from the north bank just westward of a marshy opening. Then steer 260° true (W $\frac{1}{4}$ S mag.) for a little over $\frac{1}{4}$ mile to a position between buoys Nos. 3 and 4. The shoalest water in the creek (about 10 feet) is between the buoys, and the best water can be carried by keeping the extreme end of the piling outside of Randall Wharf light in range with the tallest tree beyond until a little past the buoys, then shaping the course to pass 70 yards northward of the light.

Round the light at a distance of 70 yards, and steer 218° true (SW mag.), with the south point at the entrance to the creek ahead.

Leave buoy No. 1 about 30 yards on the starboard hand, and when past it edge a little westward and bring Randall Wharf light astern on a 230° true (SW by W $\frac{1}{8}$ W mag.) course, leaving buoy No. 2 100 yards on the port hand and the horizontally striped buoy off Welch Point 200 yards or more on the starboard hand. This course slightly favors the southern bank at the entrance of Back Creek, and leads 275 yards northward of Courthouse Point, which is the prominently projecting point on the south bank $\frac{3}{4}$ mile from the entrance to Back Creek.

Continue the 230° true (SW by W $\frac{1}{8}$ W mag.) course nearly $\frac{1}{2}$ mile past Courthouse Point, and when Old Field Point light (pile structure in water off prominent point of north bank) bears 286° true (NW by W $\frac{7}{8}$ W mag.), distant nearly $\frac{1}{4}$ mile, steer 256° true (W $\frac{5}{8}$ S mag.) so as to pass about 225 yards southward of it. Continue the course for $\frac{7}{8}$ mile past the light to a position 350 yards northward of Old Town Point Wharf light, and then haul southward to a mid-channel position westward of it. Then steer 225° true (SW $\frac{5}{8}$ W mag.) for 5 miles, keeping in the middle of the river to the entrance at Turkey Point.

Turkey Point to Baltimore, 35 miles.—From the middle of the entrance of Elk River abreast Turkey Point, steer 235° true (SW by W $\frac{1}{2}$ W mag.) for 11 miles, passing $\frac{3}{8}$ mile off Howell Point, a little over $\frac{1}{4}$ mile southeastward of the black buoy lying near the middle of the bay off Still Pond, and to a position $\frac{1}{4}$ mile northwestward of Worton Point Shoal gas buoy.

Then steer 209° true (SW $\frac{3}{4}$ S mag.) for $3\frac{1}{4}$ miles to a position $\frac{1}{4}$ mile east-southeastward of bell buoy No. 3. Then steer 261° true (W $\frac{1}{8}$ S mag.) on the Pooles Island range (posts with white slatted daymarks) ahead, passing $\frac{1}{8}$ mile southward of the bell buoy and to a position 100 yards northwestward of buoy No. 4. Then steer 229° true (SW by W mag.) for $1\frac{1}{2}$ miles to a position 150 yards southeastward of Pooles Island Flats gas buoy. Then steer 238° true (SW by W $\frac{3}{4}$ W mag.) for 9 miles to gas and bell buoy No. 3B, Brewerton Channel. This course leads $\frac{3}{8}$ mile northwestward of a red buoy and $\frac{3}{4}$ mile northwestward of Craighill Channel range front light.

Then follow the dredged channels to Baltimore, course 291° true (NW by W $\frac{1}{2}$ W mag.) on the Brewerton Channel range, following the buoys to gas and bell buoy No. 12B; then steer a little more northward to gas and bell buoy No. 4M; and then steer 320° true (NW by N mag.), following the buoys which mark the Fort McHenry Channel to Lazaretto Point. Then steer more northward into Baltimore Harbor between Lazaretto Point lighthouse and Fort McHenry, passing eastward of the two black buoys on the northeast side of Fort McHenry. The anchorages in Baltimore Harbor are marked by white buoys; they are on the northeasterly side of the harbor between Canton and Fells Point, and in the cove on the southerly side eastward of Federal Hill.

Baltimore to Sandy Point, 20 miles.—Follow the dredged channels as described in the preceding paragraph to gas and bell buoy No. 3B, Brewerton Channel, and then steer southeastward to gas and bell buoy No. 13K. Then steer 149° true (SSE $\frac{1}{8}$ E mag.) on the Cutoff Channel range astern, and follow the buoys to gas and bell buoy No.

5K nearly 1 mile southward of Seven Foot Knoll lighthouse. Then steer 161° true (S by E $\frac{1}{8}$ E mag.) for $1\frac{1}{2}$ miles to gas and bell buoy No. 9C. Then steer 180° true (S $\frac{5}{8}$ W mag.) on the Craighill Channel range astern, and follow the buoys to a position 350 yards eastward of Baltimore lighthouse. Then steer 154° true (S by E $\frac{3}{4}$ E mag.) for $2\frac{3}{4}$ miles to a position $\frac{3}{4}$ mile eastward of Sandy Point lighthouse.

Turkey Point to Sandy Point direct, 32 miles.—From the middle of the entrance of Elk River abreast Turkey Point steer 235° true (SW by W $\frac{1}{2}$ W mag.) for 11 miles, passing $\frac{3}{8}$ mile off Howell Point, a little over $\frac{1}{4}$ mile southeastward of the black buoy lying near the middle of the bay off Still Pond, and to a position $\frac{1}{4}$ mile northwestward of Worton Point Shoal gas buoy.

Then steer 202° true (SSW $\frac{5}{8}$ W mag.) for $7\frac{1}{2}$ miles, passing nearly $\frac{3}{8}$ mile westward of a red buoy, nearly $\frac{1}{4}$ mile eastward of buoy No. 3, and to a position 300 yards eastward of the black buoy lying westward of the summer resort of Tolchester Beach. Then steer 218° true (SW mag.) for $3\frac{1}{2}$ miles until Craighill Channel range front lighthouse bears 286° true (WNW mag.). Then steer 198° true (SSW $\frac{1}{4}$ W mag.) for $9\frac{1}{2}$ miles, passing over $\frac{1}{4}$ mile westward of the red buoy off Swan Point, and to a position $\frac{3}{4}$ mile eastward of Sandy Point lighthouse.

Sandy Point to Norfolk, 138 miles.—From a position $\frac{3}{4}$ mile eastward of Sandy Point lighthouse steer 197° true (SSW $\frac{1}{8}$ W mag.) for $7\frac{1}{4}$ miles to a position 1 mile eastward of Thomas Point Shoal lighthouse. Then steer 186° true (S by W $\frac{1}{8}$ W mag.) for 9 miles, passing $1\frac{1}{2}$ miles westward of Bloody Point Bar lighthouse, and to Poplar Island Shoal gas and bell buoy. Then steer 177° true (S $\frac{3}{8}$ W mag.) for 12 miles, passing $2\frac{1}{2}$ miles westward of Sharps Island lighthouse, and to Sharps Island gas and bell buoy.

From Sharps Island gas and bell buoy make good a 163° true (S by E mag.) course for 42 miles, passing 1 mile eastward of Cove Point lighthouse, $1\frac{7}{8}$ miles eastward of Cedar Point lighthouse, $2\frac{1}{2}$ miles westward of Hooper Island lighthouse, $1\frac{1}{2}$ miles eastward of Point No Point lighthouse, and to a position 1 mile eastward of Smith Point lighthouse.

Then make good a 180° true (S $\frac{1}{2}$ W mag.) course for $29\frac{1}{2}$ miles, passing close to Tangier Island Shoal Lump gas and bell buoy, $3\frac{1}{4}$ miles eastward of Windmill Point lighthouse, and $1\frac{1}{4}$ miles eastward of the black bell buoy at the end of Rappahannock Spit, and to a position 1 mile eastward of Wolf Trap lighthouse.

Then make good a 186° true (S by W mag.) course for 23 miles, passing 1 mile eastward of New Point Comfort Middle Ground buoy, 3 miles eastward of York Spit and Back River lighthouses, and in a depth of about 15 feet across the Horseshoe about 1 mile eastward of Thimble Shoal lighthouse.

On approaching Thimble Shoal lighthouse haul westward and pass 300 yards southward of it. Then steer 251° true (WSW $\frac{3}{4}$ W mag.), pass about $\frac{1}{4}$ mile northward of Willoughby Spit gas and bell buoy, and pass about midway between Old Point Comfort and Fort Wool. Then steer 234° true (SW by W $\frac{1}{4}$ W mag.) for Newport News Middle Ground lighthouse and pass northward of Sewall

Point Shoal gas and bell buoy. Pass about 200 yards westward of this buoy and stand southward in the dredged channel to Norfolk, being guided by the buoys, some lighted, and Bush Bluff light vessel, which mark the edges of the channel. The courses are 184° true (S $\frac{7}{8}$ W mag.) to abreast Bush Bluff light vessel, then 172° true (S $\frac{1}{4}$ E mag.) until abreast the southerly piers at Lambert Point, and then 131° true (SE $\frac{1}{8}$ S mag.) to the city wharves.

Norfolk, on the eastern bank of the Elizabeth River, 7 miles above Sewall Point, is an important shipping port for foreign, coastwise, and bay vessels. It has communication by ferry with Portsmouth and Berkley and steamboat connections with Newport News, Old Point Comfort, Washington, Baltimore, and other bay ports. Several lines of coastwise steamers ply between Norfolk and the important commercial ports north and south. There is railroad connection to all parts of the country.

The anchorages for small vessels near Norfolk are on the northeast side of the channel opposite Hospital Point, on the west side of the channel between Hospital Point and Portsmouth, and on the south side of the Eastern Branch between Norfolk and Berkley.

There are two public docks on the Norfolk water front used by small local craft. One is eastward from Hospital Point and at the head of the slip on the north side of the Merchants & Miners' Transportation Co. wharf; there is also a small boat landing at the head of the slip on the south side of this wharf, at which landings can be made with permission of the agent. The other public dock is a slip 100 yards long lying 80 yards westward of the ferry slips.

NORFOLK TO BEAUFORT, N. C.

From the Southern Branch of Elizabeth River to Albemarle Sound there are two routes that are used: One, through the Albemarle and Chesapeake Canal, North Landing River, Coinjock Canal, and North River, is under improvement by the Government and is free of tolls; and the other through Deep Creek, Dismal Swamp Canal, and Pasquotank River. Thence the route leads through Albemarle, Croatan, and Pamlico Sounds, Neuse River, Adams Creek, canal to Core Creek, and Beaufort Harbor. The passage is good for a draft of 9 feet by the way of Dismal Swamp Canal, and 8 feet by the way of Albemarle and Chesapeake Canal; improvements are in progress to secure a depth of 12 feet from Norfolk to Beaufort, N. C., by way of the Albemarle and Chesapeake Canal route. The distance from Norfolk to Beaufort Harbor entrance, N. C., is about 185 nautical miles by the way of Dismal Swamp Canal and 182 miles by the way of Albemarle and Chesapeake Canal.

Supplies.—Coal, gasoline, provisions, and other supplies can be obtained at Norfolk, Elizabeth City, Morehead City, and Beaufort, N. C., and gasoline and provisions in limited quantities at all villages along the route.

Fresh water can be obtained at Norfolk, Elizabeth City, Morehead City, and Beaufort, and water suitable for boilers can be taken from the canals, the upper end of the narrow part of North Landing River, and Pasquotank River at and above Elizabeth City.

Repairs.—There are marine railways and facilities for repairing vessels at Norfolk and Elizabeth City, and for small craft at Morehead City and Beaufort, N. C.

A pilot can be obtained on inquiring at Norfolk, Elizabeth City, Morehead City, or Beaufort, N. C.

Tides are experienced only in the Southern Branch of Elizabeth River and Beaufort Harbor. In Albemarle and Pamlico Sounds and tributaries winds have considerable effect in raising or lowering the water, as mentioned in the following description.

ALBEMARLE AND CHESAPEAKE CANAL ROUTE.

Southern Branch of Elizabeth River (chart 451) forms the northern approach to the two canals which afford passages from Chesapeake Bay to the inland waters of North Carolina. This branch is of considerable commercial importance; there are several large lumber mills and other manufactories at which vessels load, and the commerce using the canals also passes through the branch. Between the navy yard at Portsmouth and Deep Creek the branch is crossed by three railroad drawbridges; two drawbridges cross the branch above Deep Creek; the least width of draw opening is 80 feet.

Between the first and second bridges the channel has been dredged 300 feet wide and 25 feet deep, and between the second and third bridges 200 feet wide and 22 feet deep; above this and to the lock of the Albemarle and Chesapeake Canal the depth in the channel is about 9 feet. The channel for its whole length of 10½ miles is marked by buoys, and is not difficult to navigate as far as the entrance to Deep Creek. Above this to the lock of the Albemarle and Chesapeake Canal some local knowledge is needed to follow the channel. Improvements are in progress to deepen the channel to 12 feet.

The **Albemarle and Chesapeake Canal** route has been purchased by the Government and is free of tolls. This canal connects the Southern Branch of Elizabeth River with North Landing River, and has one lock at its northern end, about 10½ miles from Norfolk. This canal is 7¼ miles long and affords a passage for vessels 200 feet long, 39 feet beam, and 8½ feet draft (1916), to be increased to 12 feet; it is crossed by four drawbridges, all having draw openings greater than the width of the lock. The depth of water in the canal is lowered by northerly winds and raised by southerly winds; severe storms may cause a difference of 2 feet or more below or above the normal.

The following are extracts from the regulations prescribed by the Secretary of War for the use of the Government canals and waterways between Norfolk and Beaufort, N. C., copies of which are posted along the route:

The signal for the lock is two long and two short blasts of the whistle, and for a bridge three long blasts. Boats approaching other boats shall give the passing signals prescribed in the Pilot Rules of the Steamboat Inspection Service. The draft that can enter the lock is shown by gauges. Boats will not be permitted to enter or leave the lock until the gates are fully in the recesses, and the lock keeper has ordered the boat to start. Vessels must be securely moored in

the lock. Vessels must have their sides free from projections that might injure the walls, and must be provided with and use suitable fenders. No vessel shall obstruct the canal or approaches, or tie up for some hours or days in the narrow parts of the waterway without proper authority. The limit of speed in the canals is 5 statute miles per hour for tows and vessels over 100 feet in length, and 6 statute miles for vessels less than 100 feet in length, and vessels approaching others must slacken speed. Rafts and tows must give to packets the side demanded by a proper signal. No refuse of any kind shall be placed in the canals or natural waterways, or on the banks; nor shall anyone clean flues in the locks. Trespass on or injury to canal property is forbidden.

North Landing River is $10\frac{1}{2}$ miles long in its narrow part from the Albemarle & Chesapeake Canal to light No. 1, 100 to 300 feet wide, and has a depth of $8\frac{1}{2}$ feet or more, to be increased to 12 feet. Southward of light No. 1 the channel is a dredged cut, 250 feet wide and 12 feet deep, through the broad part of North Landing River, and 90 feet wide and 12 feet deep through Coinjock Bay, and a canal to the head of North River, a total distance of 19 miles.

Tides.—There are no tides in these waters, and the water level depends on the force and direction of the wind. Northerly winds lower the water and southerly winds raise it, there being at times a difference of 2 feet or more below or above the normal with strong, long-continued winds from one direction.

Munden is a post village and railroad terminal on the east side of North Landing River, a little over 1 mile southward of light No. 2. From the dredged cut off the wharf a depth of $7\frac{1}{2}$ feet can be carried to the wharf, which has a depth of 8 feet at its end and on the north side.

Currituck is a small village on the west side opposite the mouth of North Landing River.

There is a station of the Lighthouse Service at the entrance of Coinjock Bay, on the west side of the channel just southward of light No. 8.

Coinjock is a post village on the canal between Coinjock Bay and North River.

Currituck Sound is a narrow and shoal body of water extending from Albemarle Sound in a north-northwesterly direction for 25 miles, and is separated from the ocean by a narrow strip of sand beach. The lower part of the sound is navigable for boats of 4 to 5 feet draft for a distance of 11 miles above the entrance from Albemarle Sound, but the navigation is difficult on account of extensive shoals.

Back Bay and its connection with Currituck Sound extends a little over 10 miles northward from the northeastern end of the sound. The bay is shoal and navigable only for boats. Northward of Back Bay is a shallow body of water known as North Bay.

North River is $4\frac{1}{2}$ miles long in its narrower part from light No. 9 to light No. 10, and thence for 7 miles to the entrance at North River lighthouse the river is wide and nearly straight. The river has depth of 9 feet or more, to be increased to 12 feet, and its navigation is not difficult with the aid of the chart. A dredged cut leads across the entrance of the river, and is marked by range lights.

DISMAL SWAMP CANAL ROUTE.

Southern branch of Elizabeth River is described under Albemarle and Chesapeake Canal route.

Deep Creek, which empties into the Southern Branch about 6 miles above Norfolk, is $2\frac{1}{2}$ miles long to the entrance of the Dismal Swamp Canal; the creek has been improved by dredging a channel 100 feet wide and 10 feet deep from the Southern Branch to the canal. On the south side at the entrance of the creek there is a lighted sign-board directing the way to the Dismal Swamp Canal.

Dismal Swamp Canal (Lake Drummond Canal & Water Co.'s Canal) connects Deep Creek with the Pasquotank River; the northern lock of the canal is about $8\frac{1}{2}$ miles above Norfolk. This canal is about 19 miles long, 60 feet wide, and 9 to 10 feet deep, with turnouts at distances of about 3 miles where vessels may pass each other; the two locks are 250 feet long and 39 feet wide. Four drawbridges cross the canal, and all have draw openings wider than the width of the locks; the settlements on its banks are the post villages of Deep Creek at the north entrance, Wallaceton, about 8 miles from the north entrance, and South Mills, about $\frac{1}{3}$ mile inside the southern lock of the canal. The navigation of Deep Creek and a part of Pasquotank River requires local knowledge to carry the best water. Toll is collected at the northern lock.

The following are extracts from the rules and regulations of the Lake Drummond Canal & Water Co., a copy of which will be furnished by the company on application:

"Vessels arriving at the locks are required to come to and make fast 150 feet from the gates. Sailing vessels will not be permitted to sail in the canal. Where they have centerboards they must be entirely hoisted up when under way. No vessel of any description shall pass through the canal at a rate exceeding 5 statute miles an hour, except by permission of the superintendent in writing. Vessels passing through the canal shall keep to the right. When a vessel is overtaken by another going in the same direction, the slower shall give the inner track to the faster, unless within 300 yards of a lock or bridge. Steamers shall pass each other on the right and shall give signals as required by United States laws, and shall come to a minimum speed in passing vessels. Vessels approaching a lock, bridge, or vessel shall give notice by giving three blasts of whistle, or by sounding a horn, or ringing a bell at a distance of at least 400 yards. Vessels navigating the canal at night shall carry regulation lights as prescribed by United States laws; and while lying in the canal, vessels and rafts must show lights head and stern."

Turners Cut is a canal $3\frac{3}{4}$ miles long, 100 feet wide, and 10 feet deep, which extends in nearly a straight line from the Dismal Swamp Canal to Pasquotank River.

Pasquotank River has a length of $12\frac{1}{2}$ miles from the southerly end of Turners Cut to Elizabeth City, and thence 15 miles to Wade Point lighthouse, at the entrance from Albemarle Sound. The upper part of the river has been improved by dredging where necessary, and is good for a depth of 10 feet from Turners Cut to Albemarle Sound. Local knowledge is required in places to keep in the best water. Two drawbridges cross the river, one about 3 miles above Elizabeth City and the other at the city.

Elizabeth City, on the west bank of Elizabeth River 15 miles above Wade Point lighthouse, is one of the important towns on the inland waters of North Carolina. It has railroad communication and communication by launch or steamer with adjacent waters. Anchorage can be had just below the city on the north side of the channel, eastward of a red buoy, in 7 to 12 feet of water.

The bulkheads, forming the water front, have a sufficient depth alongside, and a vessel can usually find a berth. Provisions, anthracite and bituminous coal, some ship chandlery, gasoline, and water can be obtained. The river water is suitable for boilers at and above Elizabeth City. The largest marine railway is about 200 feet long, with a capacity of 800 tons, and there are facilities for repairing machinery and the hulls of wooden vessels. Storm warnings are displayed.

ALBEMARLE AND PAMLICO SOUNDS.

Albemarle Sound has depths of 10 to 18 feet along the tracks from North and Pasquotank Rivers to Croatan Sound and less water farther eastward. In heavy weather the passage is uncomfortable and even dangerous for open boats. Fish stakes and nets, extending long distances from the shore, are often found on the shoals, especially at the northern entrance of Croatan Sound.

Croatan Sound, west of Roanoke Island, connects Albemarle and Pamlico Sounds, and is used by vessels bound through the sounds. A draft of about 8 feet can be taken through Croatan Sound when the water is at its ordinary level, and the channel is well marked for vessels of this draft; barges of 9 feet draft pass through the sound, but are liable to get aground. Strangers should not attempt to pass through Croatan Sound at night. Fish stakes and nets are numerous in season, especially at the northern and southern ends of the sound.

Roanoke Marshes is the name applied to the point and fishing station westward of Roanoke Marshes lighthouse. A crooked slough, from 50 to 100 yards wide, leads in a north and south direction across the point, and the fishing station with a number of small wharves is on this slough. A small vessel can enter either end of the slough and make fast to the steep banks or at the wharves, with good shelter. The least depth at either entrance is 7 feet, and the depth in the slough varies from 12 to 16 feet. Both entrances are sometimes nearly blocked by fish stakes, but there is a narrow, clear passage. The north entrance is westward of the islet lying northward of the island on which the huts are located. A mid-channel course should be followed in the slough, and care is required when passing the opening between the islet and the island.

Wanchese is a post village at the south end of Roanoke Island, and has a landing near the mouth of Oyster Creek, $2\frac{3}{4}$ miles northeastward of Roanoke Marshes lighthouse. There are stores, and gasoline is obtainable. There is a railway on the creek for hauling out boats of 4 feet draft and 50 feet length. Boats can pass on either side of Oyster Creek light in entering. There is said to be good anchorage for small craft.

Roanoke Sound lies between Roanoke Island and a sand beach which separates it from the ocean. A depth of 6 feet can be carried from Albemarle Sound, through the northern part of Roanoke

Sound, and through a dredged channel 100 feet wide into Shallowbag Bay to the wharves of the village of Manteo. There is a narrow channel, through which a draft of 4 feet can be carried close to the eastern side of Roanoke Island from Shallowbag Bay to Pamlico Sound; it is marked only at its southern end, but is used considerably by local boats. The best water lies 150 yards off the island from Shallowbag Bay to the mouth of Broad Creek, and about $\frac{3}{8}$ mile off from the south side of Broad Creek to the south end of the island.

Shallowbag Bay is a good anchorage for small craft of less than 6 feet draft. There is communication by steamer with Elizabeth City and by power boats with the neighboring villages, and facilities for hauling out vessels of 20 tons weight and 4 feet draft. Nags Head is a summer resort on the east side of Roanoke Sound, eastward of the north end of Roanoke Island; there is a depth of 6 feet at the end of the wharf.

To enter Roanoke Sound from northward, pass northward of Collington Island Shoal light at a distance not greater than $\frac{1}{4}$ mile, and steer 101° true (ESE $\frac{1}{2}$ E mag.) for 5 miles to Nags Head light, giving Roanoke Island a berth of over $\frac{5}{8}$ mile. Pass northward and close eastward of Nags Head light and steer about 162° true (S by E $\frac{1}{8}$ E mag.) for $1\frac{1}{2}$ miles to Dolbys Point light. Pass 50 feet eastward of the light and steer about 217° true (SW $\frac{1}{4}$ S mag.) for $\frac{5}{8}$ mile, then steer westward, passing close southward of a local beacon, and then northwestward to the wharves. The channel is sometimes marked by bush stakes in addition to the lights. Strangers of 4 feet or less draft should have no trouble in entering. Anchorage can be had southeastward of the wharf, at a distance not greater than $\frac{1}{4}$ mile; also in the bay between the wharf and Ballast Point. A channel 100 feet wide has been dredged along the wharves.

Tides in Croatan and Roanoke Sounds depend entirely on the winds, which may, under exceptional conditions, lower or raise the level as much of $1\frac{1}{2}$ feet from the normal; easterly winds lower the water and westerly winds raise it. Strong northerly or southerly winds produce currents, which are especially marked when the wind shifts suddenly to the opposite point.

Pamlico Sound is the largest body of water in North Carolina, and is separated from the Atlantic by a narrow beach extending from Bodie Island lighthouse to Cape Hatteras, a distance of about 35 miles, and thence in a west-southwesterly direction for about 35 miles. From Croatan Sound to the mouth of Neuse River the distance through the middle of Pamlico Sound is about 65 miles; the greatest width of the sound is about 24 miles. Oregon, New, Hatteras and Ocracoke Inlets pierce the narrow beach, giving access to the ocean; but all are blocked by inside bars with little depth over them.

The northern and western shores of the sound are irregular, being broken by numerous small bays and by two large rivers, Pamlico River and Neuse River. The general depth of water in the middle of the sound is between 3 and 4 fathoms, but shoals in many places extend miles from the shore; northward of Ocracoke Inlet, Bluff Shoal, with 7 to 10 feet over it, extends completely across the sound.

Strong winds from any direction raise, in the exposed parts of the sound, a short, choppy sea, uncomfortable to small craft and even

dangerous to open boats; but protected anchorage for small craft may be found in the many bays along the northern shore, and along the southern shore in several sloughs which lead to sheltered berths in the lee of shoals. Middleton Anchorage and the anchorage in the bight formed by the hook of Royal Shoal can be made either day or night, and are used.

Tides, except at the inlets, where there is a rise and fall of about 2 feet, are due entirely to winds and are small, except under the influence of strong winds. Easterly and westerly winds produce the greatest change in water level, which rarely exceeds 2 feet. There are no noticeable currents except in the vicinity of the inlets.

Oregon Inlet, about 4 miles southeastward of Roanoke Island, is entered over a shifting bar, the surveyed depth on which has varied from about 6 to 10 feet or more. When inside the bar anchorage can be found under the lee of the south entrance point. The tidal currents have considerable velocity, sometimes from 3 to 4 knots, and even 5 knots on the ebb, with strong westerly winds. About 4 feet at high water can be taken from the inlet over the bulkhead into Pamlico Sound through a difficult, shifting channel. There are no aids. The inlet is used to some extent by local boats, but never by strangers.

Middleton Anchorage is a broad, open bight in the northern shore of Pamlico Sound, about 6 miles northward of Gull Shoal lighthouse. The anchorage has depths of 9 to 13 feet and is sheltered from eastward by Gibbs Shoal, which has from 1 to 4 feet over it. There is no shelter from southeasterly or southerly winds. The anchorage is large and easy of access, and is used to some extent by tows and other vessels. Two post villages, Middleton and Englehard, are situated a short distance inland from the anchorage. Vessels must pass south of the black buoy on the southeast end of Gibbs Shoal in entering.

Hatteras Inlet, 11 miles westward of Cape Hatteras lighthouse, is entered over a shifting bar, the depth over which varies from about 12 to 14 feet. It is used as a harbor of refuge by small local coasting vessels and fishermen, there being fair anchorage inside the bar in depths of 2 to 3 fathoms. Strangers should not enter without a pilot, as the buoys may not always mark the best water. Pilots are on the lookout for vessels, and will cross the bar when the sea permits. The channel over the bulkhead from the inlet to Pamlico Sound is subject to change, both in position and depth, and was said to have a depth of 5 feet in 1916. The channel is used chiefly by local fishermen. Hatteras is a post village east of the inlet.

Ocracoke Inlet, about 26 miles west-southwestward of Cape Hatteras lighthouse and 15 miles from Hatteras Inlet, is entered over a shifting bar, the depth over which varies, according to the records of the surveys for many years back, from 10 to 12 feet. Strangers should not enter without a pilot, as the buoys may not always mark the best water. Pilots are on the lookout, and will board vessels if the sea will permit them to cross the bar; but the inlet is seldom used except by local boats. There is a depth of about 6 feet from Ocracoke Inlet to Pamlico Sound through Teaches Hole Channel, which is marked by buoys and lights, and leads northeastward along the western side of Ocracoke Island and then northwestward over the bulkhead into Pamlico Sound.

Ocracoke is a village 3 miles northward of the inlet. Supplies in limited quantities are obtainable. There is good anchorage in

channel off the village and an inclosed basin for small boats having a depth of 2 feet in the entrance and 4 feet inside.

Portsmouth is a post village on the south side of Ocracoke Inlet.

Royal Shoal Anchorage.—Royal Shoal is the name given to the hook-shaped shoal extending northwest from Ocracoke Inlet. A light marks the point of the hook, and an old, abandoned lighthouse marks the northwest extremity of the shoal. Inside of the hook comparatively smooth anchorage may be had in 10 to 11 feet of water.

PAMLICO SOUND TO BEAUFORT ENTRANCE.

Neuse River empties into the western end of Pamlico Sound from westward and is one of the important rivers in North Carolina. Its mouth, which is 5 miles wide, is reduced to a navigable width of a little over 2 miles by shoals, extending offshore from each side. Neuse River lighthouse marks the outer end of the shoal on the northern side; and the southern shoal, off Point of Marsh, is marked by a light at its outer end. Garbacon Shoal, 10 miles above the mouth of the river, extends halfway across from the southern shore, leaving a clear navigable width of $\frac{7}{8}$ mile; the outer end of the shoal is marked by a light. The principal route to the sea is through this river.

Adams Creek entrance is on the south side of Neuse River, 10 miles above Neuse River lighthouse, and southward of the town of Oriental, on the opposite side of the river. It is a part of the principal route between Pamlico Sound and Beaufort Harbor. A channel 10 feet deep has been dredged through Adams Creek, and thence through a canal and dredged channels in Core Creek and Newport River to Beaufort Harbor. This channel is well marked and easily followed in the daytime and is good for vessels of 9 feet draft. The distances through the channel are as follows: Adams Creek entrance to north end of canal 5 miles, to south end of canal $10\frac{1}{2}$ miles, to Morehead City bridge, 16 miles. Two drawbridges cross the channel, one with a clear opening 65 feet wide over the canal 1 mile from its south end, and Morehead City bridge with a clear opening 50 feet wide.

Core Sound is a narrow and shoal body of water extending along and just inside the beach for a length of 27 miles, from the southwest end of Pamlico Sound to a point inside Cape Lookout. At its western end Core Sound joins a similar body of water, known as Back Sound, and a narrower body, north of Harkers Island, known as The Straits, both of which connect with Beaufort Harbor and Inlet, forming an inland waterway for boats of 4 feet draft between Pamlico Sound and Beaufort Harbor, about 5 miles shorter than the deeper route by way of Neuse River and Adams Creek. Core Sound varies in width from 2 to 3 miles, and has a general south-westerly trend. It is nearly filled with shoal banks, over which the depth ranges from 2 to 4 feet; but a channel, from 7 to 10 feet deep, winds through the sound and is continuous, except at three places, where bars of 5 feet depth must be crossed. These bars are situated as follows: Harbor Island Bar, at the entrance from Pamlico Sound; Piney Point Bar, off Piney Point, about 15 miles down the sound; and Yellow Shoal, off Bells Point, 6 miles farther southwestward.

A channel 5 feet deep and 40 feet wide has been dredged through Taylors Creek, from Lenoxville Point, at the western end of The

Straits, close along the mainland inside a row of marshy islands to the wharves at Beaufort. Directions for the passage through Core Sound and Taylors Creek are given on page 34.

Beaufort Harbor is the southern entrance to the inland waterway between Beaufort and Norfolk Harbors, and is the most important harbor on the coast between Cape Henry and Cape Fear. The most prominent and easily recognized objects are the standpipe near the large hotel at the eastern end of Morehead City and the large yellow marine biological station and radio station close to it, on Pivers Island, near Beaufort. A light is shown from the top of the standpipe.

The entrance to Beaufort Harbor is about $7\frac{1}{2}$ miles west-northwestward of Cape Lookout Lighthouse; it is obstructed by a shifting bar, which extends nearly $1\frac{1}{2}$ miles seaward. Dredging is occasionally done to obtain a channel 300 feet wide and 20 feet deep across the bar; shoaling is liable to occur soon after dredging. Ample depth for the class of vessels using the inland passage can be expected at all times. The channel is well marked by range lights and buoys. Inside the bar there is a depth of 3 to $5\frac{1}{2}$ fathoms in the channel and secure anchorage for vessels anywhere in the channel from Fort Macon, on the western side at the entrance, to the railroad bridge.

Beaufort, a town on the eastern side of the harbor, is the terminus of a branch of the Norfolk & Southern Railroad, and has communication by telephone and telegraph and power-boat communication with the villages along Core and Pamlico Sounds. Anchorage room near the town is limited, but there are several small wharves to which a draft of 6 feet can be taken at low water; small boats sometimes anchor in the channel off the wharves. Gasoline, provisions, water, and some ship chandlery can be obtained. A small supply of coal is kept on hand, and larger quantities can be had by giving notice well in advance. There are railways for hauling out vessels of $4\frac{1}{2}$ feet draft and 60 feet length, and machine shops for ordinary repairs to motors.

The town of Beaufort is reached from southward through a dredged channel 100 feet wide and 7 feet deep (1916), the least depth being found at the entrance. There is a jetty, submerged at high water, on the west side at the entrance, marked by Shark Shoal Light (horizontally striped structure) near its south end and by a black buoy a little south of the light. To enter pass about 100 feet eastward of the buoy and light and steer northward for $\frac{1}{2}$ mile, following the jetty and keeping Reids Creek Light (black structure) a little on the starboard bow until halfway to it, then heading to pass 75 yards eastward of it. When up to the light steer northeastward to pass the northwest end of Town Marsh at a distance of about 50 yards, then eastward, and follow the south and east sides of the marshy island north of Town Marsh at a distance of 50 yards until north of a red beacon off the western end of the wharves; then haul southward along the wharves.

Beaufort can also be reached from northward through Gallants Channel, which has been dredged 60 feet wide and 10 feet deep, and is well marked by lights and day ranges. It is crossed at Beaufort by a drawbridge with an opening 60 feet wide. The banks on each side show discolored at low water. To enter, follow the directions

given on page 33 to Russells Creek Light. Pass 125 feet westward of the light and steer 169° true (S $5\frac{1}{2}$ E mag.) for $\frac{7}{8}$ mile with two range beacons (white daymarks) in line ahead, showing a little to the left of two church spires, to a position close westward of a light on a red structure. Then steer 214° true (SW $5\frac{1}{2}$ S mag.) with two range beacons (white daymarks) in line astern for $\frac{5}{8}$ mile to a position close eastward of a light on a black structure. Then bring this light in range with Newport Marshes, upper light astern on a 138° true (SE $5\frac{1}{2}$ S mag.) course for $\frac{1}{2}$ mile, with the wharf at the fish factory a little on the port bow. Pass about 50 yards off the end of the wharf and steer southward for $\frac{3}{8}$ mile, heading for the draw in the railroad bridge. From the draw head for the easterly wireless tower and pass close to the end of the wharf at the wireless station. Then steer to pass north of the red beacon off the westerly wharves and haul southeastward along the wharves.

Morehead City, on the western side of the harbor, has communication by railroad, telegraph, and telephone, and is a shipping point for oysters, fish, and clams. The railroad wharf extends to deep water of the channel on the west side of the harbor near the drawbridge, and both are prominent. A channel 10 feet deep, with a least width of 100 feet, leads from Beaufort Harbor to the wharves of the town. From near Buoy No. 3, in Bogue Sound, the channel trends about 320° true (NW $3\frac{1}{4}$ N mag.) for the cupola of the hotel until about 100 yards past a light on the port hand, then 293° true (NW by W $5\frac{1}{2}$ W mag.) close to the end of the hotel wharf, and then along the wharves.

Pilots will come out to a vessel if the sea will permit them to cross the bar. They can also be obtained at Beaufort to take vessels along the coast and into the inlets between Beaufort and Winyah Bay or northward along the inland waterway.

Storm warnings are displayed at Beaufort and Morehead City.

The mean rise and fall of tides at Beaufort Entrance is 2.7 feet.

DIRECTIONS, INSIDE ROUTE FROM NORFOLK TO BEAUFORT, N. C.

Local knowledge is required in a few places to carry the best water, but vessels drawing not over 8 feet, proceeding with care, and exercising extra caution in the few places mentioned, should be able to make the passage through either canal with the aid of the charts and these directions. Strangers are advised not to run at night.

The places requiring extra caution are the Southern Branch of Elizabeth River above the mouth of Deep Creek for the route by way of the Albemarle and Chesapeake Canal, and Deep Creek and parts of Pasquotank River by way of the Dismal Swamp Canal.

DIRECTIONS, ALBEMARLE AND CHESAPEAKE CANAL ROUTE.

Norfolk to head of North Landing River, 18 miles.—The Southern Branch of Elizabeth River has a length of 6 miles to the mouth of Deep Creek and $10\frac{1}{2}$ miles to the lock of the Albemarle and Chesapeake Canal.

Entering the Southern Branch between Portsmouth and Berkley, follow a mid-river course until through the first bridge. Just above

the bridge pass westward of a black buoy, steer about 199° true (SSW $\frac{1}{8}$ W mag.) for $\frac{3}{8}$ mile and pass about 200 feet off the wharves on the western side above the bridge and westward of a black buoy above them. Then steer 168° true (S $\frac{5}{8}$ E mag.) and pass about 150 feet eastward of a red buoy just above the lumber wharves on the eastern side. Then steer 201° true (SSW $\frac{3}{8}$ W mag.) through the draw of the second bridge. From the first to just above the second bridge the channel has been dredged 300 feet wide.

When above the second bridge pass southeastward of a red buoy and steer 248° true (WSW $\frac{1}{2}$ W mag.) for $\frac{3}{8}$ mile, passing the buoys at a distance of about 100 feet. When between a red and a black buoy, which mark the turn, and a red tank is on the port beam, steer 184° true (S $\frac{7}{8}$ W mag.) and pass about 150 feet off the wharves of the creosote works on the eastern side. Then pass between a red and a black buoy, which mark the turn, steer 230° true (SW $\frac{7}{8}$ W mag.) heading for the magazine wharf, and pass westward of the black buoys. Pass about 200 feet off the magazine wharf and haul southward and eastward, leaving the black buoys on the port hand, and pass about 200 feet off the lumber wharves on the southern side. When abreast the black buoy above them, steer 89° true (E $\frac{3}{8}$ S mag.), heading midway between a red buoy and a small wharf on the northern side. When past the buoy, haul gradually southward for the draw of the third bridge, leaving another red buoy about 100 feet on the starboard hand. From just above the second to the third bridge the channel has been dredged 200 feet wide.

From the draw of the third bridge slightly favor the eastern bank for $\frac{1}{4}$ mile, then favor the western bank for a distance of $\frac{1}{2}$ mile, and then cross over so as to favor the eastern bank when abreast the mouth of Deep Creek. Thence to the Albemarle and Chesapeake Canal, at the head of Southern Branch, the channel has a width of 100 to 200 feet and is not easily followed. In general it follows the "ebb tide bends"; that is, the channel favors the upstream and avoids the downstream side of points. The safest time for a stranger is on a rising tide.

From off the mouth of Deep Creek follow the eastern bank, passing eastward of the red and black horizontally striped buoy off the mouth of the creek and eastward of the red buoy above it. Then change course gradually to 188° true (S by W $\frac{1}{4}$ W mag.) and favor the west bank from the point on that side to the wharf of the burned mill just north of the fourth bridge.

Then pass through the draw and follow the west bank from the next point on that side to the black buoy just above it. Then haul over gradually so as to follow the east bank for a short distance above the next point on that side; and then follow the west bank from the point on that side, through the draw of the fifth bridge, and to the bend $\frac{1}{4}$ mile above the bridge.

Here the river turns to about east-northeast, and the north bank should be followed until past the red buoy, which lies in the next bend. Then keep near mid-river and favor the west bank when passing the black buoy in the next bend. Then haul gradually eastward, follow the north bank, and pass in mid-channel northward of an islet.

Follow the south bank above the islet, leaving three black buoys on the port hand, and from the last buoy steer northeastward and follow the middle of the narrow part of the river around the next bend, where there is a black buoy. Then favor the east bank until up with another black buoy, and then favor the west bank in passing the bulkhead of the Richmond Cedar Works on that side. From there to the canal lock, a distance of $\frac{3}{4}$ mile, the river has an easterly direction, and the north bank, if either, should be favored.

All boats are required to stop at the canal lock and furnish certain statistics. No directions are necessary for the run through the canal; a good lookout should be kept for logs and snags.

North Landing River, Currituck Sound, and Coinjock Bay to head of North River, $29\frac{1}{2}$ miles.—North Landing River from the canal to light No. 1, a distance of $10\frac{1}{2}$ miles, is 100 to 300 feet wide and has a depth of $8\frac{1}{2}$ feet or more, to be increased to 12 feet. It is crooked, but the bends are as a rule easy. Vessels should keep in the middle of the river and give the points a good berth in rounding them. Some trouble may be experienced from snags or sunken logs. Two or three branches in the upper part of the river might confuse a stranger, but with the aid of the chart no trouble will be had from this cause. About 3 miles below the canal a branch nearly as wide as the river leads eastward; some piles are driven partly across its mouth. About $1\frac{1}{2}$ and $3\frac{1}{2}$ miles below the canal branches lead westward, but noticeable only when approaching from southward. A shoal, marked by a beacon, extends to mid-channel from the south side of the point 1 mile above (northward of) light No. 1.

Between light No. 1 and the head of North River, a distance of 19 miles, the channel is a dredged cut, 12 feet deep and 250 feet wide to the entrance of Coinjock Bay and 12 feet deep and 90 feet wide from there to the head of North River. It is easily followed by means of the lights, which are placed at the turns, and the brush stakes which mark one side of the cut. Between lights Nos. 1 and 2 the brush stakes were on the western side of the cut, and between lights Nos. 2 and 7, on the eastern side, in 1916. Spoil banks are also visible at all times on the eastern side between lights Nos. 3 and 7, and on the western side between lights Nos. 7 and 8.

Passing eastward of light No. 1, the course is about 107° true (ESE mag.) for $\frac{1}{2}$ mile to light No. 2, which is on the eastern side of the cut; then 155° true (S by E $\frac{3}{4}$ E mag.) for $2\frac{3}{8}$ miles to light No. 3, which is on the western side; then 164° true (S by E mag.) for 5 miles, passing light No. 4 and to light No. 5, which is on the western side; then 133° true (SE $\frac{1}{4}$ S mag.) for $2\frac{3}{8}$ miles to light No. 6, which is on the eastern side; then 163° true (S by E mag.) for $2\frac{1}{8}$ miles to light No. 7, which is on the eastern side; and then 187° true (S by W $\frac{1}{8}$ W mag.) for 1 mile to light No. 8, which is on the western side at the entrance of the canal and at a station of the Lighthouse Service.

From light No. 8 the course is 171° true (S $\frac{3}{8}$ E mag.) for $2\frac{5}{8}$ miles to abreast a light on the east side, and the sides of the canal are partly bare and easily followed. From here to North River the canal has a 204° true (SSW $\frac{5}{8}$ W mag.) direction for $2\frac{1}{4}$ miles. Thence the dredged cut has a 216° true (SW $\frac{3}{8}$ S mag.) direction for $\frac{1}{2}$ mile to a light, and is generally marked by brush stakes.

North River and Albemarle Sound to Croatan Lighthouse, 25 miles.—From the light at the head of North River steer about 172° true (S $\frac{1}{4}$ E mag.) for $1\frac{1}{2}$ miles in a dredged channel, generally marked by bush stakes, until up with a red buoy. Pass westward of the buoy, and then favor the north side for a distance of 1 mile until through the narrowest part of the river. Then keep in mid-river, passing eastward of a shoal sometimes marked by a brush stake, and then favor slightly the point on the west side in making the turn westward. Then steer about 234° true (SW by W $\frac{1}{4}$ W mag.) and pass about 150 yards northward of the point on the south side, where the river turns southward to a light. Then keep in mid-river, pass westward of a red buoy just above the light, pass 200 yards south-westward of the light, and steer 130° true (SE mag.) for $\frac{3}{4}$ mile. Then steer 150° true (SSE $\frac{1}{4}$ E mag.) for $5\frac{1}{4}$ miles, giving the shores a berth of over $\frac{3}{8}$ mile, and pass southward of the front light of the North River Bar range. Then bring the two lights in line astern on a 186° true (S by W mag.) course, and cross the bar on this range, passing westward of the red buoys. The range leads through a dredged cut, which is about 9 feet deep (1916), to be increased to 12 feet.

When across the bar and past the red buoy, lying about $\frac{3}{4}$ mile southward of North River lighthouse, steer 161° true (S by E $\frac{1}{4}$ E mag.) for $7\frac{1}{2}$ miles. Then steer 145° true (SSE $\frac{5}{8}$ E mag.) for $4\frac{3}{4}$ miles to a position about 250 yards eastward of the black buoy lying 1 mile north-northwestward of Croatan light; this light should be a very little on the starboard bow on this course. Then steer 152° true (SSE mag.) for Croatan light, and on nearing it change the course so as to pass close eastward of a black buoy just north of the light and 125 yards westward of the light. Then follow the directions on page 32.

DIRECTIONS, DISMAL SWAMP CANAL ROUTE.

Deep Creek, $2\frac{1}{2}$ miles.—Follow the directions on page 27 for the Southern Branch of Elizabeth River to the mouth of Deep Creek, and pass about 100 feet northward of the red and black horizontally striped buoy and nearly that distance southward of the red buoy in entering the creek. The channel in Deep Creek has been dredged about 100 feet wide and generally has little water on both sides of it. If near low water, the sides of the channel are generally indicated by the swash from the vessel's passage, and otherwise there is nothing to mark it. For a distance of 300 yards inside the entrance to the first bend the channel favors the north bank, and then for a further distance of 300 yards until halfway to the next bend the channel favors the west bank. The channel then follows the middle of the creek, except in its widest part, $\frac{5}{8}$ mile below the canal lock, where it follows the north bank.

Turners Cut is $3\frac{3}{4}$ miles long, and the only directions necessary are to keep in the middle. From the lock of the Dismal Swamp Canal it has a southerly direction for $\frac{3}{8}$ mile, and then a southeasterly direction for $3\frac{3}{8}$ miles to Pasquotank River. About $\frac{5}{8}$ mile below the lock the old river crosses the cut in a north and south direction. At the southerly end of the cut the old river joins it from west-southwestward.

Pasquotank River from Turners Cut to Elizabeth City, $12\frac{1}{2}$ miles.—In the following description the terms "right" and "left" banks are applied as seen when bound southward. Several branches, which enter from the right or western bank of the river are liable to confuse a stranger; the rule is to keep to the left passage, bound southward. On account of some sharp bends in the narrow parts of the river and shoal water in the broader parts, strangers are advised to proceed with caution in its uncharted part above Elizabeth City. It is also advisable to keep the leads going on both sides, as the slope on either side of the channel is usually sufficient to make the difference in depth obtained with the two leads an indication of where the deeper water lies.

From Turners Cut to the point on the right bank just below Coopers Creek, a distance of $4\frac{1}{2}$ miles, the river gradually widens from 100 to 300 feet, and a mid-river course should be followed. At this point the river widens suddenly, and the channel, which is a dredged cut 150 feet wide with a least depth of about 7 feet on either side, favors the left bank, following it at a distance of about 300 feet until around the next point on the left bank about $5\frac{1}{8}$ mile farther down. Here the dredged channel leads between two buoys and takes a 148° true (SSE $\frac{3}{8}$ E mag.) direction to a position 350 feet off Shipyard Landing (on the left bank $5\frac{1}{2}$ miles below Turners Cut). Then change course gradually to 189° true (S by W $\frac{1}{4}$ W mag.) and pass 100 feet off the point on the right bank just below Shipyard Landing. Continue the course to mid-river, and so continue in the narrower part of the river around the next bend until approaching Goat Island.

When $6\frac{1}{4}$ miles below Turners Cut pass in mid-channel northeastward of Goat Island which is $\frac{1}{4}$ mile long and has a black buoy at its upper and lower ends. Favor the left bank just below the island until abreast the mouth of the creek on the left bank. Then keep in mid-river. The Norfolk & Southern Railroad bridge crosses the river $9\frac{5}{8}$ miles below Turners Cut; the draw has a clear width of 48 feet. In rounding the sharp point 1 mile below the railroad bridge, the bight may be favored slightly just above and below the point to assist in making the turn, but keep near mid-river off the point itself. Then keep in mid-river, favor the log boom and lumber wharf on the right bank in rounding the next point on that side, and then favor slightly the right bank until through the lift bridge at Elizabeth City, which is $12\frac{1}{2}$ miles below Turners Cut. Vessels may go alongside the wharves at Elizabeth City, either above or below the bridge; anchorage is usually made around the bend below the bridge.

Pasquotank River and Albemarle Sound from Elizabeth City to Croatan lighthouse, 31 miles.—From the lift bridge favor the wharves of Elizabeth City, pass southward of a red buoy, and then steer 96° true (E by S mag.) for Hospital Point (on north shore) until in mid-river. Then steer 117° true (SE by E $\frac{1}{8}$ E mag.), pass 100 yards northward of Cobb Point light, and continue the course $2\frac{1}{2}$ miles past the light to a position $5\frac{1}{8}$ mile off the western shore below Brick House Point. Then steer 136° true (SE $\frac{1}{2}$ S mag.) for $7\frac{1}{2}$ miles with Anson Point astern, keeping about in mid-river, leaving a red buoy nearly $\frac{1}{4}$ mile on the port hand, a black buoy $\frac{1}{4}$ mile on the starboard hand, and Poquoson Point light $\frac{1}{4}$ mile on the port hand. From a position $\frac{1}{2}$ mile southward of Poquoson Point light steer 106°

true (ESE $\frac{1}{8}$ E mag.), give the shore a berth of over $\frac{1}{2}$ mile, and pass $\frac{3}{8}$ to $\frac{1}{2}$ mile northward of Wade Point lighthouse.

When Wade Point lighthouse bears 265° true (W mag.) distant 1 mile, steer 145° true (SSE $\frac{5}{8}$ E mag.) for $1\frac{1}{2}$ miles to a position about 200 yards eastward of the black buoy lying $1\frac{3}{8}$ miles north-northwestward of Croatan lighthouse; the lighthouse should be made and kept a very little on the starboard bow on this course. Then steer 152° true (SSE mag.) for Croatan lighthouse, and on nearing it change the course so as to pass close eastward of a black buoy just northward of the lighthouse and 125 yards westward of the lighthouse.

DIRECTIONS, CROATAN LIGHTHOUSE TO BEAUFORT HARBOR ENTRANCE.

The following directions are good for vessels of 8 feet draft by way of Neuse River and Adams Creek, and for boats of 3 to 4 feet draft by way of Core Sound. The distance by way of Adams Creek is about 110 miles, and by way of Core Sound about 100 miles.

Croatan Sound.—From a position 125 yards westward of Croatan lighthouse, pass eastward of the black buoy just south of the lighthouse, and then steer 144° true (SSE $\frac{3}{4}$ E mag.) for $1\frac{3}{8}$ miles to a position westward of a red buoy; then steer 128° true (SE mag.) for $2\frac{3}{4}$ miles, following the buoys, to a position $\frac{1}{8}$ mile eastward of Blockade Shoal light. Then steer 170° true (S $\frac{3}{8}$ E mag.) for $5\frac{1}{2}$ miles and pass 50 to 100 yards eastward of Roanoke Marshes lighthouse.

Pamlico Sound.—Then bring Roanoke Marshes lighthouse astern on a 177° true (S $\frac{1}{4}$ W mag.) course, passing eastward of a horizontally striped buoy and well westward of another horizontally striped buoy, and to a position between a red and a black buoy $1\frac{1}{2}$ miles southward of the lighthouse. Then steer 167° true (S $\frac{5}{8}$ E mag.) for $5\frac{1}{2}$ miles, giving the shore a berth of about $1\frac{1}{2}$ miles, until Stumpy Point bears 254° true (W by S mag.). Then steer 178° true (S $\frac{1}{4}$ W mag.) for 10 miles until Long Shoal lighthouse bears 310° true (NW mag.) distant $2\frac{3}{8}$ miles.

Then make good a 225° true (SW $\frac{1}{2}$ W mag.) course for $27\frac{1}{2}$ miles to a position $\frac{1}{4}$ mile southward of Bluff Shoal lighthouse. Then make good a 246° true (WSW $\frac{1}{4}$ W mag.) course for 12 miles to a position $\frac{1}{2}$ mile southward of Brant Island Shoal lighthouse. Then make good a 265° true (W $\frac{1}{8}$ S mag.) course for $9\frac{1}{4}$ miles to a position northward of Point of Marsh black buoy, with Point of Marsh light bearing 201° true (SSW $\frac{1}{4}$ mag.) distance $1\frac{1}{4}$ miles. Then make good a 236° true (SW by W $\frac{3}{8}$ W mag.) course for $11\frac{1}{4}$ miles, passing nearly $\frac{3}{4}$ mile southward of Neuse River lighthouse, $\frac{1}{4}$ mile southward of the red buoy marking Gum Thicket Shoal, and to a position $\frac{1}{4}$ mile northward of Garbacon Shoal light.

From a position $\frac{1}{4}$ mile northwestward of Garbacon Shoal light steer 212° true (SW $\frac{3}{4}$ S mag.) for $2\frac{1}{4}$ miles, heading for the point on the south side of the river westward of Adams Creek. When Adams Creek light bears 154° true (SSE mag.) distant $\frac{3}{4}$ mile, steer this course and pass 100 yards eastward of the light.

Vessels of 6 feet or less draft can follow the northwest shore of Pamlico Sound more closely, as follows:

Bring Roanoke Marshes lighthouse astern on a 177° true (S $\frac{1}{8}$ W mag.) course, giving the shore a berth of about 1 mile, until $7\frac{1}{2}$ miles from the light and Stumpy Point bears 265° true (W mag.). Then steer 184° true (S $\frac{7}{8}$ W mag.) for 7 miles, heading for Long Shoal lighthouse. Cross Long Shoal about $\frac{3}{8}$ mile northwestward of the lighthouse and steer 225° true (SW $\frac{1}{2}$ W mag.) for 17 miles, to a position $\frac{1}{4}$ mile southward of Gull Shoal lighthouse. Then steer 239° true (SW by W $\frac{5}{8}$ W mag.) for $15\frac{1}{2}$ miles, passing $\frac{1}{2}$ and 1 mile, respectively, southward of two red buoys and to the horizontally striped buoy at the southeast end of Lower Middle. Then steer 249° true (WSW $\frac{1}{2}$ W mag.) for 8 miles, heading for Brant Island Slue light. Pass about 250 yards southward of this light and steer 232° true (SW by W mag.) for 6 miles, to a position northward of Point of Marsh black buoy, then follow the directions preceding.

Adams Creek to Core Creek.—The dredged cuts are 250 feet wide in Adams Creek to Isaacs Creek light, thence 125 feet wide to North Entrance Canal light, 90 feet wide in the canal to Core Creek, 125 feet wide in Core Creek, and thence 250 feet wide to Beaufort Harbor.

Passing 100 yards eastward of Adams Creek light, steer 168° true (S $\frac{3}{4}$ E mag.) for the water tank near the wharves on the west side. Leave the black buoy 125 feet on the port hand and steer about 134° true (SE $\frac{1}{4}$ S mag.) for $1\frac{3}{8}$ miles with Dumpling Creek range lights (white daymarks) in line ahead.

Leave Dumpling Creek range front light on the port hand and steer about 147° true (SSE $\frac{1}{2}$ E mag.) for $\frac{5}{8}$ mile to a position close westward of Cedar Creek range front light.

Then bring Cedar Creek range lights in line astern on a 206° true (SSW $\frac{3}{4}$ W mag.) course for $1\frac{3}{4}$ miles to a position close westward of Isaacs Creek light; a single light serves as the rear range for both Dumpling Creek and Cedar Creek ranges.

Leave Isaacs Creek light on the port hand and steer 241° true (SW by W $\frac{3}{4}$ W mag.) for North Entrance Canal light (white daymark). This course should lead about 125 feet off the notice board on the north bank and then near mid-creek. Leave North Entrance Canal light about 60 feet on the starboard hand, steer 216° true (SW $\frac{1}{2}$ S mag.) and keep in mid-creek or favor the west bank slightly in rounding the next point on the east side.

Keep in mid-channel through the canal, the limit of speed being $5\frac{1}{4}$ miles (6 statute miles) per hour for vessels without tows and of less than 100 feet in length.

Core Creek and Beaufort Harbor.—From the south end of the canal steer 184° true (S $\frac{3}{4}$ W mag.) for $\frac{3}{8}$ mile in the first section of the dredged cut to a position 75 yards eastward of Core Creek upper light; the grass marks the east side of this dredged cut, but on the west side is a flat bare at low water. Then steer 178° true (S $\frac{1}{8}$ W mag.) for $1\frac{3}{4}$ miles with Core Creek range lights in line ahead, to a position westward of a red buoy; the sides of the cut are flats bare at low water and visible at all times.

Leave the red buoy about 100 feet on the port hand and steer 146° true (SSE $\frac{5}{8}$ E mag.) for 1 mile with Russells Creek light a little on the port bow; two beacons will be in range ahead on this course. Leave Russells Creek light 125 feet on the port hand

and steer 199° true (SSW mag.) for $1\frac{1}{4}$ miles, with two beacons in range astern. Leave Newport Marshes upper light about 125 feet on the starboard hand and steer 226° true (SW $\frac{3}{8}$ W mag.). Pass midway between Newport Marshes lower light and a red buoy just south of it, steer 201° true (SSW $\frac{1}{4}$ W mag.) for the end of the wharf house which shows over the bridge a little to the right of the draw until past a light on the port hand, and steer for the draw when less than 300 yards from it.

From the draw steer 178° true (S $\frac{1}{8}$ W mag.) to a position 100 yards eastward of a horizontally striped buoy, and then steer 165° true (S by E mag.) until approaching the marsh on the southern side. Then steer southeastward, follow the marsh at a distance of 125 yards, and leave buoy No. 6 on the port hand. When past this buoy give the shore a berth of over 150 yards and steer about 111° true (SE by E $\frac{3}{4}$ E mag.) to a position about 100 yards southwestward of buoy No. 4. Then steer about 156° true (S by E $\frac{3}{4}$ E mag.) to a position on Bird Island Range midway between a black and a horizontally striped buoy and 200 yards eastward of Fort Macon Spit light. Then steer 200° true (SSW $\frac{1}{8}$ W mag.) with Bird Island range lights in line astern, following the buoys to the entrance whistling buoy, from which a course can be shaped as desired.

Directions, Pamlico Sound to Beaufort Harbor by way of Core Sound.—The depths in Core Sound are affected by the winds, northerly and northeasterly winds causing high water, and westerly and southwesterly winds low water.

The channel through Core Sound and The Straits is marked on each side by lights on red or black structures, and by piles with red or black boards pointing to the best water, and in the fairway by white and black vertically striped beacons. The red structures and stakes are left to starboard and the black to port going westward, and the black and white beacons are passed close-to on either side. The aids must be relied upon to keep in the best water, and the following general directions are intended only to assist in finding them. Chart 421 is the best guide.

From Long Shoal lighthouse steer 224° true (SW $\frac{1}{4}$ W mag.) for $32\frac{3}{4}$ miles to a position $\frac{1}{2}$ mile northwest of Royal Shoal northwest unused lighthouse (old tower), leaving Gull Shoal lighthouse $1\frac{1}{8}$ miles to starboard and Bluff Shoal lighthouse $1\frac{1}{4}$ miles to port. Then steer 194° true (S by W $\frac{5}{8}$ W mag.) for 9 miles to Harbor Island Bar entrance buoy (black and white prependicularily striped) with Harbor Island Bar lighthouse a little on the starboard bow.

The channel over Harbor Island Bar has a depth of 5 feet, and is sometimes partially marked by stakes. In 1916 the best water led from the bar buoy westward, about 250 yards northward of the light, then southward, about 150 yards westward of the light. A stranger drawing over 4 feet should employ a local fisherman for a pilot or sound out the channel.

From Harbor Island Bar lighthouse the channel trends about 186° true (S $\frac{7}{8}$ W mag.) for $3\frac{5}{8}$ miles to East Drum Shoal light (black structure), passing westward of Harbor Island (marked by a house), and Goulds Lump light (black structure); thence about 251° true (WSW $\frac{5}{8}$ W mag.) for $1\frac{3}{8}$ miles to West Drum Shoal light (black

structure); thence about 217° true (SW $\frac{3}{8}$ S mag.) for $1\frac{5}{8}$ miles to Lewis Creek light (black structure); thence 223° true (SW $\frac{1}{4}$ W mag.) for $3\frac{1}{2}$ miles to White Point light (red structure); thence 250° true (WSW $\frac{5}{8}$ W mag.) for $\frac{1}{2}$ mile to Atlantic light (black structure); thence 222° true (SW $\frac{1}{8}$ W mag.) for $2\frac{3}{8}$ miles, passing Steep Point light (red structure) and to Mill Point light (black structure); thence 260° true (W $\frac{1}{2}$ S mag.) for $\frac{1}{2}$ mile to Nelson Bay light (black structure); and thence 220° true (SW mag.) for $1\frac{7}{8}$ miles to Piney Point light (black structure).

From Piney Point light the channel trends west-southwestward for $\frac{1}{2}$ mile to Bretts Point light (black structure); and thence west-northwestward and then southwestward over Piney Point Bar, where it is well marked by side stakes and by Bretts Bay light (red structure) and Kings Point light (black structure).

From Kings Point light the channel trends 205° true (SSW $\frac{5}{8}$ W mag.) for $3\frac{3}{4}$ miles, passing Davis Shore light (red structure) and to Davis Island light (black structure); thence 243° true (WSW mag.) for $1\frac{1}{8}$ miles to Jarrets Bay light (black structure); and thence 160° true (S by E $\frac{3}{8}$ E mag.) for $1\frac{1}{4}$ miles to Bells Point light (black structure).

From Bells Point light the channel trends 247° true (WSW $\frac{3}{8}$ W mag.) to Straits Entrance light (black structure), and continues westward through The Straits; the distance from Bells Point light to The Straits is 2 miles, and thence through The Straits to the west end of Harkers Island is $3\frac{1}{2}$ miles. The channel is narrow and well marked by lights and stakes on each side. From North River light (red structure abreast the west end of Harkers Island) the channel crosses in a southwest direction to Shepherd Shoal light (red structure); thence westward to within $\frac{1}{4}$ mile of Middle Marshes light (black structure).

From this point boats desiring to go to Beaufort Inlet can continue past Middle Marshes light, then steer about 243° true (WSW mag.) to Shackleford Point. Thence the channel is marked by buoys and trends west-northwestward to the main channel of Beaufort Harbor.

But the more protected route, dredged to a depth of 5 feet and width of 40 feet, leads through Taylors Creek, close along the mainland to the wharves at Beaufort. The entrance is $\frac{1}{4}$ mile north-northeastward of Middle Marshes light, and is marked by a light on the east side. Pass close westward of the light and head for the wharf at Lenoxville Point until close to it. From here the channel leads westward, close along shore inside all of the islands, is marked by red beacons at the turns and by spoil banks in places, and is easily followed.

BEAUFORT ENTRANCE TO CAPE FEAR RIVER.

Westward of Beaufort Harbor there is an inside passage as far as Bogue or Bear Inlet for boats of 4 feet draft at high water, and as far as New River Inlet for 3 feet draft at high water; a draft of about $1\frac{1}{2}$ feet can be carried at high tide as far as Wrightsville Inlet, but this section is never used by strangers. There are several inlets between Beaufort Harbor and Cape Fear through which 6 or

7 feet at high tide can be taken to sheltered anchorage, but all are obstructed by shifting bars on which the sea breaks when at all rough.

Large numbers of the small craft bound southward along the coast leave the inside waters at Beaufort with favorable weather and plan to make Cape Fear River in a single day. Sometimes they go as far as Bogue Inlet inside, and pass out of the inlet at high water. Bear Inlet was good and easy of navigation in 1916, but the waters connecting it with the inland waterway eastward have a depth of only $2\frac{1}{2}$ feet at low water and are difficult without local knowledge. Boats going outside seldom go as far as New River Inlet inside, as the inland waterway is difficult in places, and New River Inlet is considered difficult to run.

An onshore wind, even if light, will cause a heavy break on the bars, while an offshore wind may be heavy without making the bars dangerous. Strangers in small craft should not leave a sheltered anchorage bound southward with the wind anywhere between southeast and southwest, and should make an anchorage as soon as possible after the wind begins to blow from these directions. In entering or leaving the inlets, the appearance of the water is the best guide, as breakers always form on the shoal areas; but strangers should not attempt to enter an inlet when breakers form entirely across it.

With local knowledge, a smooth sea, and high water, boats of 5 feet or less draft can enter Cape Fear River through Corncake Inlet, and boats of about 8 feet or less draft can cross Frying Pan Shoals through Cape Fear Swash. Otherwise all vessels must pass outside Frying Pan Shoals, by which route the distance from Entrance whistling buoy off Beaufort Harbor to smooth water in Cape Fear River is 112 miles. Pilots for the inlets, inland passages, and open waters between Beaufort and Charleston can be had at Beaufort.

BEAUFORT ENTRANCE TO NEW RIVER INLET.

Bogue Sound is shallow, extends 21 miles westward along the coast from Beaufort Harbor to Bogue Inlet, and is separated from the ocean by Bogue Banks, a wooded beach $\frac{1}{8}$ to $\frac{3}{4}$ mile wide. The sound has a width of about 2 miles near its middle, but narrows at each end; its western end is partly closed by marshy islets. A channel dredged where necessary to a depth of 3 feet and width of 100 feet, extends through Bogue Sound from Beaufort Harbor to Swansboro, and is navigable for a draft of 4 feet at high water to Swansboro or Bogue Inlet.

The channel is buoyed from Beaufort Harbor nearly to Carolina City (marked by fish factory and several mills), a distance of $1\frac{1}{2}$ miles. Westward of Carolina City the channel follows the north shore at a distance of $\frac{1}{8}$ to $\frac{1}{4}$ mile for 9 miles to the mouth of Broad Creek, and is marked by stakes with black or red boards pointing to the channel and by lights; red marks are left on the starboard hand and black on the port, going west. About $1\frac{1}{2}$ miles westward of Carolina City there is a light which marks the south side of a short dredged cut through a shoal; at Broad Creek is the beginning of the dredged cut which follows closely the north shore for $5\frac{1}{2}$ miles

to Guthries Point, and is well marked by lights and piles and by spoil banks on one or both sides.

From Guthries Point the waterway follows the natural channel, and is well marked by lights and beacons for $1\frac{1}{2}$ miles to Hunting Island. From the light on the south end of Hunting Island the waterway leads westward to the marshy islets, and then between them and the wooded north shore for $\frac{1}{2}$ mile, then leaves a small and a large island to starboard, and follows the well-defined channel between the islands for $\frac{3}{4}$ mile to the mouth of the channel leading westward to Swansboro, marked on the east side by a red beacon.

Boats bound to Bogue Inlet should continue past this beacon and follow the main channel southward for $\frac{5}{8}$ mile, then westward for $\frac{1}{2}$ mile, passing northward of two islets, to the marsh on the west side, then southward to the inlet. The shoals in the vicinity of the inlet are subject to change, and no directions can be given. The buoys and the appearance of the water are the best guides.

Boats bound to Swansboro, to Bear Inlet, or the inland waterway beyond Swansboro should enter the channel southward of the red beacon mentioned above, and follow it westward to its outlet in Main Channel, then continue westward, past a broad opening leading toward Swansboro, and into the opening leading westward. Continue in mid-channel westward to the high land, follow this northwestward, and then steer northward in a dredged channel, marked by spoil banks, to the water front of Swansboro.

Provisions and gasoline are obtainable at Swansboro, and there is a railway for hauling out boats 60 feet long and 4 feet draft, and machine shops for ordinary repairs to motors. Storm warnings are displayed.

Tides in Bogue Sound vary from about $3\frac{1}{2}$ feet average rise and fall at each end, near the inlets, to about 1 foot where the tides meet near the middle. Strong south or southwest winds may raise the tide a foot or even more and north to northwest winds lower it a corresponding amount.

From Swansboro to New River Inlet there is an inside passage which has been improved in places by dredging to a minimum width of 40 feet in the cuts and a minimum depth of 4 feet at mean high tide; it is used by boats of 3 feet draft. The passage is not marked, and although there are evidences of dredging in places, a stranger may encounter some difficulty in following the channel.

Tides in this passage vary from an average rise and fall of about $3\frac{1}{2}$ feet at the inlets to $1\frac{1}{2}$ feet at points remote from the inlets: the latter may be increased to 2 feet by strong southerly winds.

From Swansboro the waterway leads southwestward between an islet marked by a shanty, and the mainland, keeps well in the bight westward of the islet and follows the shore southward and westward to the mouth of Queens Creek. It leads southwestward across the mouth of Queens Creek and then follows a dredged channel, well marked by spoil banks, for 6 miles until close to Brown Inlet.

It follows the beach closely across Brown Inlet and then follows a very crooked natural waterway at a distance of $\frac{1}{8}$ to $\frac{3}{8}$ mile from the beach for about 3 miles. There are many branches, but the waterway follows the main stream, which is usually well defined. From this point to New River the waterway runs approximately parallel

to the coast and is well defined by the evidences of dredging. In the wider passages, favor the side upon which the dredged material is deposited. The waterway crosses two open bodies of water, but is well defined by the spoil banks.

Bogue Inlet is 22 miles westward of Beaufort Harbor and 3 miles southward of the town of Swansboro, which can be seen from outside. The inlet is between a high wooded ridge on the west and a long, low spit on the east; on the inside of the spit, 1 mile eastward of the inlet, is a Coast Guard station. The entrance is obstructed by a shifting bar, extending about $\frac{1}{2}$ mile seaward, through which the channel depth varies from a minimum of 3 feet at low tide in some years to a maximum of 14 feet at high tide in other years; in June, 1916, there was a depth of about $3\frac{1}{2}$ feet on the bar. The tides have a range of about $3\frac{1}{2}$ feet on the bar, and high water occurs 2 hours earlier on the bar than at the head of the marshes inside. The channel is marked by a sea buoy, $\frac{1}{2}$ mile outside the bar, and by small buoys on the bar and in the entrance. There are no regular pilots; some one familiar with the channel may sometimes be had from the Coast Guard station. A stranger should wait for a rising tide and should never attempt to enter when the bar is breaking; the bar buoys can not be seen when there is any sea on.

The channels inside the inlet are subject to considerable change and no directions for navigating them can be given. A depth of about 3 feet at low water and 4 feet at high water can be brought to the inlet from eastward, as described under Bogue Sound preceding.

From the inlet to Swansboro, a distance of 4 miles, the channel has a depth of about 3 feet at low water. The channel is obstructed by shoals, and at high tide the marshes on each side are covered, rendering it difficult for a stranger to follow.

Bear Inlet, $3\frac{1}{2}$ miles westward of Bogue Inlet, is considered the safest along this coast and is used considerably as a harbor by local boats and to some extent by pleasure craft bound to or from the inside waters. The entrance is about $\frac{1}{4}$ mile wide between high sand dunes. It has a broad, straight channel, and is marked by buoys; in June, 1916, there was about 7 feet on the bar at low water. There is good anchorage close to the beach on the eastern side, just inside the inlet.

Boats bound to Bear Inlet inside can carry the best water ($2\frac{1}{2}$ feet at low water and 4 feet at high water) by following the inland waterway as described on page 37 to Swansboro. From here the best water leads westward, between an islet marked by a shanty and the mainland, and then southward, following the main channel leading westward of Higgins and Dudley Islands, to the beach $\frac{1}{2}$ mile westward of Bogue Inlet, then follows a narrow channel westward, parallel to the beach, to Bear Inlet. Boats of 3 feet draft can go direct from Bogue Inlet to Bear Inlet, just inside the beach, at high water only.

Brown Inlet, 3 miles westward of Bear Inlet, had a depth of 3 or 4 feet in 1916; it is little used. The entrance is similar in appearance to Bear Inlet.

New River Inlet, 35 miles westward of Beaufort Harbor, is not marked, is considered dangerous by local pilots, and should not be attempted except under the most favorable conditions. There is a strong ebb current from the inlet, sometimes as long as ~~three hours~~

after low tide, which causes a heavy break on the bar when there is any sea outside. In June, 1916, there was 5 feet at low tide on the bar, which was broad and showed no well-defined channel, and is subject to rapid change. The entrance is narrow, with spits on both sides, and only shows when open. On the western side of the opening there is a wooded hammock and on the eastern side bare sand dunes and a shanty. There is a group of shanties 1 mile westward of the inlet.

Tides.—The mean rise and fall at these inlets is about 3.5 feet; but freshets, particularly in New River, may raise the level a foot or more inside. On the bars at the entrances of the inlets between Cape Lookout and Cape Fear high and low waters are about one hour earlier than at Charleston.

NEW RIVER INLET TO CAPE FEAR.

From **New River Inlet** to **Wrightsville Inlet** there is a continuous passage said to be navigable for a draft of 1½ feet at high tide. It is used to some extent by fishermen in small power boats, but is said to be difficult to follow, and should never be attempted by strangers.

New Topsail Inlet is 18 miles westward of **New River Inlet** and 53 miles westward of **Beaufort Harbor**. The channel is unmarked, and is obstructed by a shifting bar, which had shoaled to a depth of about 3½ feet in 1916. A small house stands on the eastern spit, about ½ mile from its end. This inlet is used by local boats, but should not be entered by a stranger.

Old Topsail Inlet, 2 miles westward of **New Topsail Inlet**, had a depth of about 6 feet across a broad bar in June, 1916, in an unmarked channel, easily entered with a smooth sea. The shores on each side are low sand beaches and there are no distinguishing marks.

Rich and Queens Inlets are 5 miles and 8½ miles, respectively, westward of **New Topsail Inlet**, and have channel depths over their bars of 2 to 4 feet at low tide. They are used to some extent as anchorages by small local craft, but are not recommended to strangers.

Wrightsville Inlet is 11½ miles southwestward of **New Topsail Inlet** and 23¾ miles north-northeastward of **Cape Fear lighthouse**. Lying 2½ miles southwestward is **Masonboro Inlet**, and on the beach between the two inlets is the summer resort of **Wrightsville Beach**, the large hotels and buildings of which are visible from far offshore. **Wrightsville Inlet** is used to a considerable extent as an anchorage for small yachts. The opening is a little over ½ mile wide between spits, and is about ½ mile northeastward of the most northern hotel on the beach. A bar extends less than ½ mile seaward from the opening, and in June, 1916, the minimum channel depth on it was 6 feet at low water. At that time the best water in entering followed the shore at a distance of about 350 yards from abreast the northerly hotel, northward to the inlet; passed close to the beach on the south side in entering; then close to the beach on the north, to avoid a shoal extending northeastward from the inner point of the beach on the south side.

Vessels can find anchorage in the lee of either spit or can go southward as far as the bridge, carrying from 5 to 7 feet. Landing can be made at a wharf on the railroad bridge near its eastern end. An

electric railway connects Wrightsville Beach with Wilmington. The average rise and fall is about 4 feet.

Corncake Inlet, 4 miles northward of Cape Fear lighthouse, and the southerly of two openings in this vicinity $2\frac{1}{2}$ miles apart, is connected with Cape Fear River by a shallow passage north of Smith Island, known locally as Cedar Creek or the Thoroughfare; it is much used by small craft to avoid rough water on Frying Pan Shoals and is a short cut from northward into Cape Fear River. In June, 1916, there was about 5 feet at low water on the bar and $1\frac{1}{2}$ feet in the shallowest part of the channel through to Cape Fear River, and a draft of 5 feet could be taken through at high water. The bar was short and close to the entrance and the channel over it was narrow and well defined by shoals on each side, the shoal on the northern side being nearly bare at low tide; the entrance was $\frac{1}{8}$ mile wide between low sand spits. Boats often enter the inlet as soon as the height of tide permits and anchor just inside, close to the southern spit, until able to go through into the river.

From the inlet the channel follows the western shore of the southern spit and some marshy islands at a distance of 50 to 100 yards for about $\frac{1}{2}$ mile, and then crosses Buzzard Bay on a west-southwesterly course, with the tank at Fort Caswell well on the starboard bow. The crossing is the shallowest place, beyond which there should be little difficulty getting into the river. The channel trends southwestward and southward at a distance of 50 to 100 yards off the marshy islets on the western side, until down to the last one, which at high tide shows only as a few tufts of grass. Rounding this islet the channel trends about 324° true (NW by N mag.) until abreast a concrete pile on the starboard hand; then about 245° true (WSW mag.), following the northern shore of Smith Island to a position close to a narrow point of marsh on the starboard hand; from here steer west-northwestward, heading about midway between Fort Caswell and Southport, for $\frac{1}{4}$ mile, then west-southwestward, with Fort Caswell well on the starboard bow, for 1 mile to the main channel of Cape Fear River. The mean rise and fall of tides is about 4 feet.

Cape Fear Swash is a narrow channel across Frying Pan Shoals, 1 mile southward of Cape Fear lighthouse, and about $\frac{3}{4}$ mile southward of the point of the Cape as determined in 1914. It has a depth of about 12 feet, according to the latest survey; is marked by buoys, and is used by local vessels up to 12 feet or more draft at high water. The channel in 1916 was approximately as charted, and strangers using it should be guided by the chart and the buoys, and should use it with caution, on account of the shifting nature of the shoals in this vicinity. Pilots for the swash or Corncake Inlet can be obtained at Southport.

DIRECTIONS BEAUFORT ENTRANCE TO CAPE FEAR RIVER.

From the sea buoy off Beaufort entrance, a 221° true (SW mag.) course for 86 miles leads to the light vessel off Frying Pan Shoals, crossing the outer shoals in $4\frac{1}{2}$ to 5 fathoms of water. From the light vessel a 291° true (WNW mag.) course for 4 miles, followed by a 328° true (NNW $\frac{5}{8}$ W mag.) course for 17 miles, leads to the whistling buoy off Cape Fear River and passes close to red whistling buoy No. 2, 5 miles from the turn. The bell buoy at the mouth of

the main channel leading to Cape Fear River is 2 miles 30° true (NNE $\frac{7}{8}$ E mag.) from the whistling buoy; and from there in the channel is marked by buoys and lighted range beacons. (See "Cape Fear River," following.)

The above courses give the shortest passage for a vessel obliged to go outside the entire distance and around Frying Pan Shoals; but light-draft boats may find an advantage in following the coast more closely and be in position to go into the inlets if desired. For their use the following courses are given:

From the sea buoy at Beaufort entrance, a 264° true (W $\frac{1}{4}$ S mag.) course for about 21 miles leads to the sea buoy off Bogue Inlet; thence 237° true (SW by W $\frac{3}{8}$ W mag.) for 30 $\frac{1}{2}$ miles to a position 1 mile southeast of New Topsail Inlet; thence 221° true (SW $\frac{1}{8}$ S mag.) for 11 miles to a position 1 mile southeast of Wrightsville Inlet (this inlet can be recognized by the large hotels and buildings on the beach just southwestward of it); thence 202° true (SSW $\frac{1}{4}$ W mag.) for 19 miles to a position a little over a mile eastward of Corncake Inlet. For information concerning Corncake Inlet and Cape Fear Swash, see description preceding.

CAPE FEAR, N. C., TO WINYAH BAY, S. C.

Southwestward of Cape Fear River there is another stretch of open water for about 73 miles to Winyah Bay; there is no inside passage along this coast, but there are several inlets open to light-draft vessels, all of which are shoal and only one marked by buoys.

Cape Fear River enters the ocean just west of Cape Fear and is navigable for a draft of 26 feet to Wilmington, 27 miles above the mouth. The main channel over the bar, known as Bald Head Channel, is well marked by buoys and lighted ranges as follows: From the bell buoy off the mouth of this channel the first course is 59° true (NE by E $\frac{1}{2}$ E mag.) on the New Channel range (two white lights on white frame structures, the front range on the shoal westward of Bald Head lighthouse and the rear range near the marsh northward of this lighthouse) for 1 $\frac{1}{4}$ miles, being guided by the buoys, to buoy No. 4. When red buoy No. 4 is abeam the course changes to 85° true (E $\frac{1}{4}$ N mag.) on the Bald Head range (two red lights on white structures on the shore southward of Bald Head lighthouse) to within $\frac{1}{4}$ mile of the shore. Then follow the shore northeastward at a distance of $\frac{1}{8}$ to $\frac{1}{4}$ mile until westward of Fort Caswell front light (white daymark on skeleton structure), and then bring it in range with Bald Head lighthouse astern on a 335° true (NNW mag.) course past Fort Caswell on the west bank at the mouth of the river, and about 300 yards past the light (red structure) southwestward of Battery Island, when the course is changed gradually to starboard to pass close to the wharves at Southport.

Western Bar Channel, close to Oak Island at Fort Caswell, is used considerably by small craft bound westward along the coast. It is good for about 4 $\frac{1}{2}$ feet at low tide, but is not buoyed. The best water lies from 100 to 200 yards offshore south of Fort Caswell, and from there the channel through the shoals runs about 256° true (W by S mag.). Abreast the Coast Guard station the shore should not be approached closer than $\frac{1}{4}$ mile.

Southport is a town on the west bank of the Cape Fear River, $1\frac{1}{2}$ miles above Fort Caswell. There is good anchorage in the river abreast the town and deep water at the wharves. A railroad connects with Wilmington; and there is also connection by river steam-boat. Fresh water and gasoline can be had at the wharves, and provisions in the town. Storm warnings are displayed at Southport and at the Coast Guard station west of the river mouth.

Lockwoods Folly Inlet is about 11 miles westward of the Cape Fear River. The depth on the bar was about 3 feet in 1916 at low tide; there are no aids for entering; the passage into the river is said to be difficult for a stranger. There are several small towns on Lockwoods Folly River that are reached by small sail and power boats. The inlet is distinguished by a house inside and several huts on the beach about $\frac{1}{2}$ mile westward of it.

Shallotte Inlet is about $18\frac{1}{2}$ miles westward of Cape Fear River. It is said to be comparatively easy for a stranger to enter, although there are no aids to navigation, and changes have occurred at the mouth since the survey on which the chart is based. The depth on the bar at low water was said to be about 4 feet in 1916. Shallotte, an incorporated town on this inlet, has considerable trade with Wilmington by means of small sailing and power craft.

Tubbs Inlet, 5 miles westward of Shallotte Inlet, had a depth in 1916 of about 4 feet in an unmarked channel across the bar. There is a landing and a store 1 mile from the inlet, to which a depth of 5 feet can be carried at high water.

Little River Inlet, South Carolina, is about 27 miles westward of Cape Fear River. The opening, about $1\frac{1}{4}$ miles wide between spits, is partly filled by Bird Island, which is $\frac{3}{4}$ mile wide. The main channel is close westward of Bird Island, and is marked by a sea buoy outside the bar and several smaller buoys inside; and there is a black and white beacon on Bird Island; in June, 1916, there was a depth of about 4 feet at low tide on the bar, but there is sometimes more, and the channel is subject also to change in position. Boats up to 7 feet draft go to the wharf at the lower end of Little River, a town on the river of the same name about $3\frac{1}{2}$ miles above the entrance. The river is obstructed by shoals and difficult for a distance of $1\frac{1}{4}$ miles below the wharf to the lower sawmill. The entrance is marked by a prominent, high, white sand dune on Waiters Island on the west side of the inlet, at the foot of which are several huts. The best water in 1916 led across the bar on a north-easterly course, and close along the westerly end of Bird Island. The mean rise and fall of tides is 4.8 feet.

Myrtle Beach is a summer resort with railroad communication on the beach on the east side at the mouth of Eight Mile, or Wither, Swash, nearly 20 miles west-southwestward of Little River Inlet and $31\frac{1}{2}$ miles north-northeastward of Georgetown lighthouse.

North Inlet, about 7 miles northward of Georgetown lighthouse, is connected by both Town Creek and Jones Creek with Winyah Bay; Jones Creek, the southerly thoroughfare, is easier to follow and is good for 6 feet at high tide. In 1916 there were two openings about $\frac{1}{2}$ mile apart. The southern entrance had a depth of about 3 feet on the bar, is the easier to enter, and the only one that should be used by strangers. The high sand dunes between the two inlets

are the most prominent in this vicinity. Strangers are advised not to enter with a greater draft than 3 or 4 feet, and then only with a smooth sea and on a rising tide. The best water in 1916 led southward of a wreck, showing above high water, just outside the entrance. The appearance of the water is the best guide. When inside, haul southward to pass midway between the sand spit and the marsh, and follow the marsh on the starboard hand southward through Jones Creek. One mile below the inlet, Jones Creek bends west-southwest, then south; beyond this last bend keep to the left at all openings. From the southern end of the creek, steer about 218° true (SW $\frac{1}{2}$ S mag.) for red buoy No. 4 in Winyah Bay. The average rise and fall is 4.5 feet.

Winyah Bay is the first harbor southward of Cape Fear River navigable for vessels of moderate draft. It is the northern limit of the continuous inland waterways of the south Atlantic coast. The opening is between North and South Islands, and is marked by Georgetown lighthouse, near the southern end of North Island. The channel into the mouth of the bay is maintained by jetties, extending eastward from the southern tip of North Island and from a point on South Island southwest of the former. A depth of about 18 feet at low tide can be carried, through a dredged channel, 11 miles up the bay to the city of Georgetown, at the junction of the Sampit and Peegee Rivers. Jones Creek, which connects with North Inlet, enters the bay 3 miles north of Georgetown lighthouse, and the entrance to Estherville and Minim Creek Canal is on the opposite side of the bay, a little north of the creek.

Pilots for the bar and bay are stationed on North Island and may be had by making the usual signal while outside.

Directions.—The end of the south jetty is marked by a light and there is a bell buoy at the approach to the channel. From the bell buoy bring South Jetty Channel range (skeleton towers, black and white day marks) on and steer 270° true (W $\frac{1}{8}$ N mag.) for them, until Middle Ground Channel range (white day marks, northward of the former) closes, bearing 285° true (WNW $\frac{1}{2}$ W mag.). Steer this range until a little over $\frac{1}{4}$ mile from the front light, then pass $\frac{1}{8}$ mile northeast of the front light and bring it in range with South Jetty Channel range rear light (both with black day marks) astern on a 337° true (N by W $\frac{7}{8}$ W mag.) course and pass the lighthouse at a distance of $\frac{1}{4}$ mile. Continue this course 1 mile above the lighthouse, until nearly up to the quarantine station on the west side; then follow the western shore at a distance of $\frac{1}{4}$ mile until it turns westward and the light (black structure) close to this shore bears 280° true (W by N mag.). Then steer 288° true (WNW $\frac{1}{4}$ mag.) for about 2 miles, passing this light at a distance of 150 yards and following the shore about 250 yards off to a position 75 yards north of a light. For the next 4 miles the channel is marked on its southern and western side by lights, about $\frac{1}{2}$ mile apart, which should be left 75 yards on the port hand. From the last light (No. 15) steer 6° true (N $\frac{5}{8}$ E mag.) for $1\frac{3}{4}$ miles, leaving a light on a red structure 100 yards on the starboard hand, to a position 150 yards west of a red buoy. Then steer 30° true (NNE $\frac{3}{4}$ E mag.) for a light on a red structure until on Sampit River range. The beacons for this range are white structures in the river north of Rabbit Island. With

these beacons in range over the stern, steer 335° true (NNW $\frac{1}{8}$ W mag.), passing westward of a beacon (white house on piles) and into the mouth of Sampit River.

Georgetown, S. C., is at the head of Winyah Bay, about 11 miles above Georgetown lighthouse. It has railroad connections and steam-boat communication with Baltimore and New York. There is sufficient depth at the wharves for vessels able to enter the bay, and there are convenient, sheltered berths for small craft. Provisions ship chandlery, coal, gasoline, and water can be obtained. Facilities for making repairs are limited; there are small machine shops and one marine railway of about 100 tons capacity for hauling out boats of 4 feet draft forward and 6 feet aft. Pilots for the inland waters can be found here at times. Storm warning signals are displayed at Georgetown and near the lighthouse.

DIRECTIONS, CAPE FEAR TO WINYAH BAY.

From the light vessel off Frying Pan Shoals, a 251° true (WSW $\frac{1}{2}$ W mag.) course for 67 miles leads to the whistling buoy off the entrance to Winyah Bay, and a 257° true (W by S mag.) course for 3 miles from there leads to the south jetty.

From the bell buoy at the mouth of Cape Fear River, a 234° true (SW by W mag.) course for 66 miles leads to the sea buoy, $1\frac{1}{4}$ miles off the south jetty; the course in is 270° true (W $\frac{1}{8}$ N mag.) from this buoy.

The above are the most direct courses, but for those who prefer to run closer to the coast, the following courses may be substituted:

From the bell buoy at the mouth of Bald Head Channel, a 268° true (W mag.) course for a little over 25 miles leads to the sea buoy off Little River Inlet.

Or, by way of the Western Bar Channel, from a position 150 yards off shore south of Fort Caswell, a 256° true (W by S mag.) course for $1\frac{3}{4}$ miles followed by a 264° true (W $\frac{3}{8}$ S mag.) course for $25\frac{1}{4}$ miles leads to Little River Inlet sea buoy.

From Little River Inlet sea buoy a 239° true (SW by W $\frac{3}{8}$ W mag.) course for 19 miles leads to a position 1 mile southeast of Myrtle Beach, a summer resort (hotel and several cottages on the sea-shore). Thence a 213° true (SW $\frac{7}{8}$ S mag.) course for $24\frac{1}{4}$ miles leads to a position 1 mile east of the new North Inlet; or a 204° true (SSW $\frac{1}{4}$ W mag.) course for $31\frac{1}{4}$ miles leads to the bell buoy at the end of the south jetty, mouth of Winyah Bay.

WINYAH BAY TO CHARLESTON.

The distance from Winyah Bay to Charleston is about 70 miles through inside waterways and passages; the shortest distance outside, over navigable waters, between the same points is about 62 miles.

The depth in 1916 was less than 3 feet in places, but the waterway can be used by boats of 5 feet draft by taking advantage of the tide in places. The shoalest places in 1916 were at the eastern entrance to the Estherville-Minim Creek Canal, in Alligator Creek, and in the vicinity of Cape Romain Harbor. The waterway from near McClellanville to Charleston has been improved by dredging to a depth of 4 feet and width of 60 feet, but 3 feet at low water and 5

feet at high water is the greatest draft that can ordinarily be carried throughout its length at all times. The channel is marked by pile beacons at the more difficult places; the even numbers are left to starboard and odd to port when bound westward. Strangers should inquire in advance as to the condition of the waterway.

Many cut-offs are made by local boats with the tide up, but strangers are advised to follow the main waterway. Charts 153 and 154 are the best guides. The cut-off most often used at high water is to leave the main waterway at Romain River, pass westward through Key Creek and Five Fathom Creek to the eastern end of Bull Bay, westward for 3 miles and south-southwestward for 4½ miles across Bull Bay to its western end, passing westward for a line of beacons, then westward for 2 miles through Bull Harbor and Bull Creek to the main waterway. There is a depth by this route of about 5 feet at high water, but strangers are advised to use the more protected and deeper waterway leading farther inland.

Tides and tidal currents are found at all parts of this inside passage. The mean rise and fall of tides varies from 3.5 to 5 feet, depending upon the distance from the inlets. During freshet conditions there are ebb currents in the Santee Rivers and Six Mile Creek amounting to 3 or 4 knots.

The **Estherville-Minim Creek Canal** enters the southwest side of Winyah Bay, ¼ mile westward of light No. 3 and about 7 miles below Georgetown. The canal is reached by the dredged channel to Georgetown, which here lies close to the western shore.

The canal is 4½ miles long, 40 to 50 feet wide, and about 4 feet deep; it leaves Winyah Bay in a southwesterly direction, thence curves south to Minim Creek. A ferry crosses the canal at Smithville, 1¾ miles from the northern entrance.

Leaving the canal go southward in **Minim Creek** for ½ mile to its mouth; and then take the passage northward of Little Crow Island, favoring the north bank for ½ mile, nearly to the mouth of a creek on the north side, and then favoring Little Crow Island to its western end. Then follow the shore of Crow Island to its western end (there are two large cedars in the water off this point). The distance from the canal to this point is 2 miles, and the least depth is 6 feet at low water.

Cross over to the south bank of **North Santee River** and follow the ebb-tide bends about 3½ miles up the river to **Six Mile Creek**, a narrower opening in the south bank of the river.

Six Mile Creek is about 3 miles long, from 150 to 200 feet wide, and 10 to 20 feet deep; it joins the North and South Santee Rivers. During freshets the water runs each way from Dark Creek and attains a velocity of 3 or 4 knots, but ordinarily the ebb current runs through from South Santee to North Santee.

From North Santee River pass up Six Mile Creek for 1½ miles to **Pleasant Creek** (the left-hand branch), and then go down the latter for nearly 3 miles to South Santee River. The passage through Pleasant Creek is not difficult for small craft, except that some of the bends are sharp. It averages about 100 feet wide and is 10 to 20 feet deep.

Large craft sometimes continue westward and southward in Six Mile Creek to its outlet into **South Santee River**, 2½ miles above the outlet of Pleasant Creek. This route is wider than Pleasant Creek

and easier to make the turns, but there is an unmarked middle ground in South Santee River, $\frac{1}{2}$ mile below the outlet of Six Mile Creek, which strangers of 4 feet or over draft may have difficulty in avoiding.

Entering South Santee River, from the middle of the entrance of Pleasant Creek steer about 106° true (ESE $\frac{1}{2}$ E mag.) and exercise care until 200 yards below the mouth of the creek, as the channel is narrow between shoals. Pass north of Brown Island, keeping close to the north bank, and follow this bank down to Alligator Creek, $1\frac{1}{2}$ miles below Pleasant Creek.

Alligator Creek runs from the south bank of South Santee River, $\frac{3}{4}$ mile below Brown Island, $6\frac{1}{4}$ miles westward and southward to the ocean near Cape Romain Harbor; it is less than 3 feet deep in places. In general the banks are steep and well defined, but at a few places mud flats reach out for a few yards. A small beacon (white boarded tripod) marks the end of an oyster rock at the western side of the outlet to sea. A broad sand bank extends southward from the point on the other side of the mouth of the creek.

Cross over from the north bank of South Santee River and enter Alligator Creek close to the eastern side to avoid a mud flat extending nearly across the creek from the western side at the entrance. Then follow a mid-channel course, keeping clear of the points at bends, and when down to an island take the passage eastward of it. Avoid the eastern shore near the mouth and pass out close to the beacon, leaving it on the starboard hand.

From the beacon steer south-southeastward for $\frac{7}{8}$ mile, and then haul southwestward, passing a red buoy close to on the starboard hand, and round the low sand spit at the north end of Cape Island into **Cape Romain Harbor**. The waterway crosses a shoal area between the beacon at the mouth of Alligator Creek and the red buoy mentioned above. Strangers should run slow and sound, and keep a lookout for shoals on either side.

Cross the harbor in a 201° true (SSW mag.) direction with Cape Romain lighthouse a little on the port bow, and enter the short passage north and west of Marsh Island (marked on both sides by sand beaches). Through this passage keep close to the northwest bank, avoiding Marsh Island after passing it close to at the northern entrance. The distance from Alligator Creek to Romain River is 4 miles and the least depth about 3 feet at low water.

Entering **Romain River**, favor the southern side until the river branches; then, taking the western branch, favor the northern side past a wide opening on the port hand. When past this opening, favor the southern and western side of the river for about $1\frac{1}{2}$ miles to a creek running northward, leaving one creek on the port hand. There turn westward and keep about in midstream until this river, which now has become quite narrow, empties into **Five Fathom Creek**, a wider body of water extending southward. Cross this water, keeping close to the northern shore, and take a northwest direction up river, favoring in general the eastern side and leaving three streams on the port hand. The river trends about northwest for $\frac{1}{2}$ mile, then about northeast by east for $\frac{1}{2}$ mile, past a shoal submerged at high water and marked by a stake, and then about north-northeast for $\frac{3}{4}$ mile to a place where several streams and sloughs join; favor the eastern side in the second reach and then the

western side. Here a dredged cut, 60 feet wide and 4 feet deep at mean low tide, extends northward through Town Creek for 1 mile to McClellanville; the cut is marked by piles along its western side; it does not form a part of the through route.

At the place mentioned above, the junction of several streams and the mouth of Town Creek, the through route, dredged to a depth of 4 feet, bears northwestward, and then westward, through Mathews Creek to Harbor River, a distance of 2 miles. There is a beacon on the north side at the entrance; several branches lead off from the main stream, but none are confusing. From Mathews Creek turn southward into Harbor River and pass west of a mid-channel shoal halfway down this reach. In the second reach pass south of an island and then keep about in mid-river to Owendaw Creek (here the river bends sharply eastward).

Go up Owendaw Creek about 2 miles, passing east of an island near the river, to a short canal through the south bank to Graham Creek. Pass through this canal and down Graham Creek nearly to its mouth. At the last bend, where the creek turns southeastward to Bull Bay, a canal bears southwestward to Saltpond Creek. Pass through this canal and down Saltpond Creek to the head of the first reach above the bay; thence through a canal to Belvedere Creek and down to the mouth of that creek. Turn southwestward here and enter a short canal to Vanderhost Creek. Go up Vanderhost Creek to a canal bearing southward to Van Ross Creek. There is an artesian well on the north bank of Van Ross Creek, just above this canal, and boats can get water here conveniently. Follow Van Ross Creek west-north-westward to its head in Sewee Bay, keeping to the starboard hand at branch passages. From McClellanville to this point, the waterway is marked in many places by beacons at the turns from one stream to another.

The channel through Sewee Bay is marked by beacons, which are left close to on the port hand. From the last beacon, steer eastward into Sewee Creek and continue downstream until Bull Bay can be seen between the banks of the creek. Then turn southward into a passage leading to Hickory Bay. The channel through Hickory Bay is marked by beacons, which should be left close to on the port hand. From the last beacon, turn eastward for $\frac{3}{8}$ mile, following the marsh on the starboard hand; then southward and leave two small creeks on the starboard hand and a wide creek on the port hand. Continue southward past the broad opening for $\frac{1}{4}$ mile, then westward for $\frac{1}{2}$ mile, following the main stream, and then southward into the mouth of Bull Narrows, which is the southerly of several openings. A cut-off has been made across one bend of Bull Narrows. Beyond this there are several branches, but the waterway follows the main stream westward and southwestward to the outlet into Price Creek, a broader stream trending southeastward to the ocean.

Cross Price Creek and enter Santee Pass, $\frac{1}{8}$ mile upstream on the opposite side; there is a hut on the south side just inside the entrance. Santee Pass makes several sharp bends, but is easily followed; at the end of the first reach there is a stream leading northward; at the end of the third reach the channel is separated from Mark Bay by little islets, and just west of here are streams, one leading eastward and one westward. After leaving Santee Pass and entering the

broader stream leading to Caper Inlet keep close to Caper Island (on the port hand); round the western end of this island at a distance of 50 yards from the bank and follow this bank southeastward at this distance for nearly $\frac{1}{2}$ mile, until opposite the eastern end of the opposite bank (Deweese Island). The distance from Price Creek to this position is $4\frac{1}{4}$ miles.

Cross over to the eastern point of Deweese Island and turn westward, following the north side of the island at a distance of 100 feet until well into the creek; then keep about in midstream to Bullyard Sound.

Cross Bullyard Sound on a 259° true (W $\frac{7}{8}$ S mag.) course through a dredged cut 60 feet wide and 4 feet deep, which is marked on its north side by piles. Then go through two other dredged cuts in the sound which are marked by range beacons ahead and beacons along the north side, courses about 196° true (S by W $\frac{1}{2}$ W mag.) for $\frac{1}{2}$ mile, and then 224° true (SW mag.) for $\frac{1}{2}$ mile until in the short arm which leads south-southwestward to Deweese Creek. The distance from Caper Creek to Deweese Creek is 3 miles and the least depth is 4 feet.

Entering Deweese Creek follow a mid-channel course westward up this creek to Hamlin Sound; thence along the southern side of the sound and out between this sound and Gray Bay, through a dredged channel, to Hamlin Creek. The channel through the sound is defined by islets and oyster banks on the northern side, separating it from the open water of the sound, and in the vicinity of Gray Bay by beacons along the southeastern side of the channel. These beacons should be left at a distance of 20 to 30 feet on the port hand. In Hamlin Creek, $1\frac{1}{4}$ miles from Gray Bay, there is a small mid-channel islet that should be left on the starboard hand, going west. Continue down Hamlin Creek to the Isle of Palms, a summer resort marked by a ferris wheel, on a narrow strip of beach between this creek and the ocean, favoring the northern or marsh shore westward of this resort.

White range beacons on the marsh north of Breach Inlet lead in the best water out of the mouth of Hamlin Creek. Keep these in line until close to the north shore, then cross Breach Inlet and follow the direction of the railroad into and up Conch Creek. Take the left branch of Conch Creek (marked by a shanty on the north side) to the canal which cuts off the southern loop of Sullivan Island Narrows; and, leaving the canal, continue through the narrows to The Cove. The passage through The Cove is marked by a red and a black beacon (red and white lights, respectively) and by white range beacons on the marsh. Hold southward from Sullivan Island Narrows for $\frac{1}{4}$ mile, leave the red beacon on the starboard hand and haul down for the black beacon, with the two white range beacons in line astern; pass close westward of the black beacon and hold up for the drawbridge. Go through the northern opening in the drawbridge, leaving on the port hand a small spindle which marks a rock pile 100 yards southeast of the southern abutment of the bridge. The passage out of The Cove is marked by a beacon (black daymark, white light) on the point of Sullivans Island, by a red beacon (red light) on the shoal west of the channel, and by white range beacons astern to lead in the best water out of The Cove. Leave Sullivans

Island light 100 feet on the port hand, bring the range beacon astern on a 243° true (SW by W $\frac{3}{4}$ W mag.) course, and pass southward of the red light. The distance from the entrance to Dewees Creek to this beacon is about 10 miles, and the depth is 4 feet.

From the last beacon steer about 275° true (W $\frac{1}{2}$ N mag.) and pass through Folly Island Channel, leaving the black buoys on the port hand and Castle Pinckney red light on the starboard hand.

If intending to stop at Charleston, hold up for the wharves on the west bank of Cooper River, leaving the red buoys on the starboard hand; but to continue southward by the inside route, when abreast of Castle Pinckney light, steer 210° true (SSW $\frac{3}{4}$ W mag.) to the horizontally striped buoy southward of Charleston, and then go up Ashley River to Wappoo Creek. The distance from The Cove entrance beacon to Charleston is 3 miles and to Wappoo Creek $4\frac{1}{2}$ miles.

Charleston is situated on the point of land at the junction of Cooper and Ashley Rivers, and has water front and wharves on each; but the wharves on Cooper River are more convenient to the city. Yachts and small craft usually anchor in Cooper River below the coal wharf; there are wharves in the vicinity of the coal wharf where yachts and motor boats are allowed to lie by paying a small wharfage charge. Pilots for the inside waters can usually be had. Provisions, ship chandlery, coal, gasoline, and fresh water can be obtained. There is a marine railway for small vessels, and repairs can be made. Storm warnings are displayed from a tower in the custom-house yard and at Moultrieville.

CHARLESTON TO ST. JOHNS RIVER.

Between Charleston and St. Johns River there is a continuous inland waterway, navigable at low tide for a draft of 6 feet. Parts of this waterway are narrow and crooked, and only by careful steering can this depth be carried; but at the more difficult places there are ranges or other guides, and by close attention to them and to the charts one should have no difficulty in getting through. All of these streams and passages are tidal and are subject to a mean rise and fall of from 5 to 7 feet. Vessels of 9 feet draft are the deepest using it, and then only with local knowledge.

The section of the waterway between Charleston and Beaufort, S. C., a distance of 75 miles, is mostly a natural waterway, with a few cut-offs in places; but from Beaufort to St. Johns River, a distance of 181 miles, it has been improved by dredging to a depth of 7 feet. Some sections of the waterway are subject to considerable shoaling, but are redredged at intervals, and 6 feet at mean low water may ordinarily be expected at all times.

CHARLESTON TO ST. HELENA SOUND.

The shoalest places between Charleston and Savannah are at the entrance of Wappoo Creek, where the depth is 7 feet; the western end of Stono River and Church Flats, 18 miles from Charleston, where the depth is not over 6 feet; at the head of South Edisto River, where the depth is about 6 feet; at the eastern end of Brick-

yard Creek, where the depth is 7 feet; and in Ramshorn Creek and Mud River, which have been dredged 7 feet deep.

Four drawbridges cross the waterway in the first 15 miles, and all have draw openings 60 feet or more wide.

Wappoo Creek and Elliott Cut have a length of 3 miles and a least depth of 7 feet. Wappoo Creek enters Ashley River through its west bank about 1 mile above the Battery (the south water front of Charleston) and opposite the buoy depot, and is marked by Wappoo Cut light on the north side of the entrance and by range beacons for entering. Elliott Cut light marks the south side of the cut at the outlet into Stono River.

From the horizontal striped buoy southward of Charleston stand up the Ashley River until abreast of Wappoo Cut light, keeping well over to the city side. Pass about 125 feet southward of Wappoo Cut light on a 237° true (SW by W $\frac{1}{8}$ W mag.) course with the range beacons ahead, favor the south bank of Wappoo Creek for a distance of $\frac{1}{2}$ mile, then the north bank to the next bend, and then the south bank to the bridge, the opening in which is on the north side of the center pier. Then keep in mid-channel to the next point, and pass close to it and to the marsh on the east side above it. Pass in mid-channel through New Cut, leaving two openings on the starboard hand, and then favor well the north bank until approaching the next bend. Then keep in mid-channel in a cut through the marsh and through Elliott Cut.

Stono River has a length of 13 miles from Elliott Cut to Wadmelaw River and a least depth of 6 feet at Church Flats. The channel in the broader part of Stono River follows the ebb-tide bends as shown on chart 154; with the exception of Church Flats, the river is not difficult.

From the west end of Elliott Cut cross Stono River on about a 273° true (W $\frac{3}{8}$ N mag.) course, and keep close to the south bank for a distance of 1 mile, nearly to the bend. Then favor the north side as far as the phosphate works and wharf at the next bend; then favor the southern side nearly to the wharf, which is just below the next bend. Pass in mid-channel off the wharf, then haul over so as to favor the starboard side around the point, and then head for the draw of the bridge. Favor the south side at the bend just above the bridge and for a distance of $\frac{1}{2}$ mile above the bend, and then the north side nearly to the ruins of the wharf and phosphate works on the north bank. A middle ground, with 5 feet over it and slightly deeper water on either side, lies nearly $\frac{1}{4}$ mile above the wharf and the same distance below a drawbridge; when past the middle ground keep about in midstream for $\frac{5}{8}$ mile to Rantowles Creek; there are two branches here, both narrow streams.

Enter the southern opening and steer midstream courses for about 4 miles to Church Flats, where the creek widens; a drawbridge crosses the waterway $1\frac{1}{2}$ miles eastward of Church Flats. The channel through Church Flats is narrow and difficult but is good for 6 feet at low tide; it is marked by two beacons, square white targets, numbered 2 and 1, on single piles. Tides meet about 1 mile eastward of Church Flats. Leave Beacon No. 2 close-to on the starboard hand and beacon No. 1 close-to on the port hand, and then favor the eastern side to the next bend. For the next 2 miles, to Wadmelaw River, the best water is near the outer sides of the bends

and about in midstream between the bends. Follow the ebb-tide bends and give the points a good berth when turning at the bends.

Wadmelaw River has a length of $9\frac{1}{2}$ miles from New Cut to the junction of North Edisto and Dawho Rivers and a depth of 10 feet or more. The upper waters of Wadmelaw River are broad and are filled with small islands and shoals, between which the channel winds and is difficult; it is marked by three lights.

Leaving New Cut, from Stono River hold to the south bank in the bend until $\frac{1}{4}$ mile past a wharf; then pass midway between the small islands on the starboard hand and a wharf and islet on the port with light No. 2 a little on the port bow; then steer a little southward of light No. 2. Leave this light about 75 yards on the starboard hand and then follow the curve of the channel to light No. 4, keeping, if anything, a little westward of a line joining lights Nos. 2 and 4 when halfway between them. Leave light No. 4 about 50 yards on the starboard hand, haul gradually westward so as to favor the south side at a distance of 150 yards, and round light No. 1 on the port hand at a distance of about 75 yards. Then follow the east bank at a distance of 75 yards, pass this distance off the two wharves in the bend, favor slightly the south bank to the next bend, with twin stacks nearly ahead and a string of islets on each side, and then favor the west bank to Youngs Village.

Youngs Village (Yonges Island post office) is a small settlement and railroad terminus on the right bank of Wadmelaw River. It is connected with river towns and settlements by steamboats. Gasoline and some supplies can be obtained here. Storm warnings are displayed. A depth of 7 to 8 feet can be taken alongside the wharf.

At Youngs Village favor the right bank down to the wharf; pass about 75 yards north of the little wooded islet south of the village, and steer 236° true (SW by W mag.) for Martins Point, on the left bank at the turn. At Martins Point hold over to the right bank and keep close under this bank until abreast the wharf and houses on the opposite bank, $\frac{1}{2}$ mile from Martins Point; then favor the left bank, passing south of an islet opposite a long wharf on the left bank. Favor the left bank past several marshy islands below the wharf, and pass 200 yards off the ruins of the wharf at Bluff Point. Then steer 219° true (SW $\frac{1}{2}$ S mag.) for White Point at the mouth of Dawho River, with a group of white buildings a little on the port bow and the buildings at Youngs Village astern, and give the point a berth of 200 yards.

Dawho River enters North Edisto River south of White Point, and winds through the marshes 12 miles to South Edisto River. It varies in width from about 75 yards to over 700 yards, and has a deep, well-defined channel, except through the broader waters near the North Edisto, where the difficult part of the channel is marked by beacons and lights; white targets with odd numbers are left on the port hand, and red targets with even numbers on the starboard hand, going westward. Thence to South Edisto River, the narrow part of the river is not difficult, although some of the bends are not easily made by anything but small craft. The entrance from South Edisto River is so narrow and, as approached from southward, resembles so closely some of the small drainage streams, that a stranger might pass it by mistake; the piles of a wharf on the south bank, just inside the opening, and the ruins of a building on the east side

of South Edisto River $\frac{1}{4}$ mile above the entrance serve to mark this entrance. Tides meet in the Dawho River about 2 miles from the South Edisto entrance.

Entering Dawho River from North Edisto River, follow the north bank at a distance of 200 yards for $\frac{3}{8}$ mile, and then steer 205° true (SSW $\frac{1}{4}$ W mag.), passing 50 yards northwestward of beacon No. 1 (which is close to the northwest side of a marshy islet) and 75 yards southeastward of beacon No. 2. Then haul gradually westward, pass 100 yards or more southward and 75 yards westward of beacon No. 4, and steer 352° true (N $\frac{5}{8}$ W mag.) for beacon No. 6 until about 200 yards from it.

Leave beacon No. 6 about 75 yards on the starboard hand, and bring it astern on a 269° true (W $\frac{1}{8}$ S mag.) course, passing 50 yards northward of beacon No. 3. Continue the course about $\frac{1}{4}$ mile past beacon No. 3, leaving a large shoal, marked by beacon 8, on the starboard hand and a small oyster bank, partly bare at low water, on the port hand. From the last position come slowly to a west-northwesterly course and follow the marshes on the northern bank at a distance of 125 yards until up to the first bend; then steer mid-channel courses, and favor the outside bank at the bends, except at the bend $\frac{3}{8}$ mile eastward of North Creek, where the best water leads close along the south side of the point.

At North Creek, about 5 miles above the last beacon, take the starboard-hand passage. At the cut-off, $1\frac{1}{4}$ miles farther upstream, favor the port shore in coming down to it and avoid turning too soon into the new passage, as a shoal makes well off the point on the northern side of the passage, and just northeastward of this point, where a sounding of 6 feet is shown on chart 154.

South Edisto River has a length of about 13 miles from Dawho River to Fenwick Island Cut, and a least depth of about 6 feet. The channel follows the ebb tide bends as shown on chart 154, and is not difficult, with the exception of the crossing 1 mile below Dawho River.

From Dawho River take the southerly of three broad openings and follow closely the eastern bank of South Edisto River for $\frac{1}{2}$ mile until abreast the western end of a small island. Then steer 244° true (SW by W $\frac{3}{4}$ W mag.) with a bushy cedar tree a little on the port bow, crossing to the western bank through a narrow channel with a depth of 6 feet, passing close southward of a red beacon; to make this crossing from southward follow the west bank until up with some piles near that bank, and then cross on a 64° true (NE by E $\frac{3}{4}$ E mag.) course.

Follow the west bank closely for $\frac{3}{4}$ mile to the bend, the south bank to within $\frac{3}{8}$ mile of the next bend, then haul over gradually and favor the west bank around this and the next bend $1\frac{1}{4}$ miles beyond, the south bank in the reach eastward, and the east bank in the next bend. Then favor slightly the east bank on a south-southwesterly course for about $\frac{5}{8}$ mile; then steer about 213° true (SW by S mag.) to the west bank, and follow it closely nearly to the next bend. Then steer about 143° true (SE $\frac{3}{4}$ S mag.) to the east bank, heading for an old house and some outbuildings, and favor this side for 1 mile. Then steer 250° true (WSW $\frac{1}{4}$ W mag.) for a small hut on the west bank, and follow that bank closely for 1 mile to **Fenwick Island Cut**, which is a canal between South Edisto

and Ashepoo Rivers, 100 feet wide and with good depth; its high, reddish slopes are visible from both rivers.

Ashepoo River has a length of $4\frac{1}{2}$ miles from Fenwick Island Cut to Combahee Bank gas buoy in St. Helena Sound, and is not difficult. From Fenwick Island Cut hold straight out into the river to avoid shoals off the points, then turn southward down the middle of Ashepoo River for $1\frac{1}{2}$ miles until nearing its mouth. Then favor the west bank and steer 209° true (SSW $\frac{5}{8}$ W mag.) to a red buoy, which is left on the port hand. Then steer about 199° true (S by W $\frac{3}{4}$ W mag.) to a black buoy, which is left on the starboard hand. Then steer about 178° true (S $\frac{1}{8}$ E mag.) and pass eastward and southward of Combahee Bank gas buoy, rounding it at a distance of about $\frac{1}{8}$ mile. The buoy marks the ruins of a light awash at high water.

INLAND ROUTE, ST. HELENA SOUND TO PORT ROYAL SOUND.

There are two inside routes between St. Helena Sound and Port Royal Sound; the principal one by way of Coosaw River, Brickyard Creek, and Beaufort River, past Beaufort and Port Royal; and the other by way of Harbor River, Story River, and Station Creek. The distance by the former, or inland route, is about $31\frac{1}{2}$ miles, and the least depth, at low tide, is 7 feet; while the distance by the latter, or coast route, is about 22 miles, and the least depth about 3 feet. The former is decidedly easier for a stranger; but the latter route can be used by a draft of 3 or 4 feet when the tide is not low.

The distance from Combahee Bank gas buoy to Brickyard Creek is 13 miles, and the route is not difficult.

St. Helena Sound.—From a position $\frac{1}{8}$ mile southwestward of Combahee Bank gas buoy, steer 292° true (WNW mag.) for $1\frac{5}{8}$ miles, to a position 300 yards southwestward of a red buoy, taking care not to get northward of this course. From the red buoy steer 308° true (NW $\frac{5}{8}$ W mag.) for $3\frac{1}{4}$ miles, passing can buoy No. 7 and the north shore $\frac{3}{4}$ mile above it at a distance of about 300 yards. When about 1 mile past buoy No. 7 steer about 270° true (W mag.) and give the south bank (north end of Morgan Island) a berth of 300 yards.

Coosaw River.—Passing 300 yards northward of Morgan Island, steer 260° true (W $\frac{7}{8}$ S mag.), pass southward of the horizontally striped buoy at the entrance of Bull River, and follow the north bank at a distance of 350 yards to buoy No. 1. Then follow the buoys, courses about 285° true (WNW $\frac{5}{8}$ W mag.) for 1 mile to buoy No. 3, then 318° true (NW $\frac{1}{4}$ N mag.) for $\frac{1}{2}$ mile to buoy No. 2, then 278° true (W $\frac{3}{4}$ N mag.) about $\frac{3}{4}$ mile to buoy No. 4, then 244° true (SW by W $\frac{3}{4}$ N mag.) about $\frac{3}{4}$ mile to buoy No. 5, then 275° true (W $\frac{1}{2}$ N mag.) about $\frac{1}{2}$ mile to buoy No. 6, and then 265° true (W $\frac{3}{8}$ S mag.) to the horizontally striped buoy at the entrance of Brickyard Creek.

Brickyard Creek has a length of 4 miles and is good for a depth of 7 feet at low water. It is marked by beacons and easy for small craft, but difficult for vessels drawing near the limit of water. The narrow channel leads in places between shoals that are bare or nearly bare at low water. Some rock was encountered in the cuts in its northern part. Strangers should take it at low water if the draft

permits, or on a rising tide, and exercise care. Chart 437 is the best guide. Tides meet about halfway through the creek.

The entrance to Brickyard Creek is between marshy shores, but the marsh on the southern side (marked by a light) is narrow and terminates just inside the creek in a red eroded bank leading up to somewhat higher ground; this eroded bank is visible from the Coosaw River at the entrance buoy. Pass 50 yards southward of the entrance buoy and steer to pass the light on the port hand at a distance of 50 yards, and follow this shore at a distance of 75 yards around the eroded point and nearly to the head of the bight south of it, passing eastward of a beacon and keeping off about twice that distance when opposite the creek at the head. There are flats, bare at low water, to the eastern edge of the channel in the bight.

When past the bight follow the marsh on the south bank at a distance of about 50 yards to the next bend and then cross over to the marsh on the west bank. The narrow channel then curves southward and eastward between a flat, bare at low water and marked by a beacon, which fills the broad bight in the west bank, and a 3-foot shoal opposite, until up with the point on the west bank at the south end of the bight. Then cross over and favor slightly the east bank in the bend while passing the higher land on that side, passing eastward of a beacon. Then cross over gradually and follow the west bank past the mouth of Mulligans Creek, which has a short stretch of dry land on its north side and several shacks and a couple of palmettos close to the bank.

From the south point at the entrance of Mulligans Creek cross over gradually to the point on the east bank $\frac{1}{4}$ mile southward, passing eastward of a beacon. Then keep near midstream past the next point on the west bank, and then follow the east bank, passing eastward of a beacon, to the next point on that side, and then keep near midstream for $\frac{3}{4}$ mile to Beaufort River.

Beaufort River has a length of 14 miles from Brickyard Creek to Port Royal Sound, and the channel is not difficult with the aid of the chart. From Brickyard Creek turn eastward down Beaufort River, favoring the south bank and passing southward of the wrecked river boat stranded on a shoal in mid-channel, and covered at extreme high water. At the next bend cross over to the east bank and follow it down to the point of marsh; then run down to the point of marsh $\frac{3}{8}$ mile below on the other side, from there working over to the marshes southeast of the city of Beaufort. Hold to this side until the wharves bear north, when they may be approached.

Beaufort, S. C., is on a point of land stretching out from the west bank of Beaufort River, 10 miles above its mouth and 3 miles below Brickyard Creek. It is on the Charleston & Western Carolina Railroad and has steamboat connections with Savannah and Charleston. The wharves are at the southern extremity of the point on which the city is located and are at the only part of the point that may be approached by vessels; depths of 12 to 14 feet are found at the wharves. Fresh water, coal, gasoline, provisions, and some other ship stores are obtainable. There is fair anchorage in the stream off the wharves.

Leaving Beaufort, pass 200 yards off the south bank and about 100 yards northwestward of a red buoy and then follow the west bank at a distance of about 200 yards. Pass eastward of a black buoy 2

miles below Beaufort, and keep near mid-river until approaching the entrance of Battery Creek, and then follow the eastern bank at a distance of about 300 yards to a black buoy at the mouth of Battery Creek.

Port Royal, on the north bank of Battery Creek, 1 mile above the mouth, is the terminus of the Charleston & Western Carolina Railroad. It has a large wharf, at which coal can sometimes be obtained. Storm warnings are displayed.

From the black buoy keep near mid-river past the naval station and pass about 100 yards westward of a red buoy lying $1\frac{1}{4}$ miles below. Then steer 166° true (S by E $\frac{1}{4}$ E mag.) to a position about 300 yards off the wharf on the eastern bank. Then steer 188° true (S $\frac{3}{4}$ W mag.) for $1\frac{3}{4}$ miles and pass about 150 yards eastward of two black buoys. From the second buoy steer about 204° true (SSW $\frac{1}{8}$ W mag.) and pass southward of the horizontally striped gas buoy on the south end of Paris Island Spit, in Port Royal Sound at the entrance of Beaufort River.

COAST ROUTE, ST. HELENA SOUND TO PORT ROYAL SOUND.

This route is about 9 miles shorter than the deeper route leading past Beaufort, S. C., and although the least depth is only about 3 feet at low water, boats up to 4 feet draft should have little trouble in using it by taking advantage of the tide. The channel leading through the shoals in St. Helena Sound to the mouth of Harbor River had a depth of about 7 feet by the last survey and is marked by beacons, red with even numbers on west side and black with odd numbers on east side. Beyond these there are few marks.

From Combahee Bank gas buoy steer west-southwestward for $\frac{7}{8}$ mile, heading for a black buoy until close to it, then haul southward through the channel across Pelican Bank, passing westward of the first beacon and eastward of the second. From here the channel leads southward, 150 yards westward of Egg Bank, a white sand bank, and eastward of a beacon just south of it, then southwestward and south-southeastward, following the beacons, to the main channel of Harbor River. The channel is narrow and the shoals on each side bare, or nearly so, at low water.

Having reached the main channel of Harbor River, steer about 219° true (SW $\frac{1}{2}$ S mag.) in Harbor River, and keep about in mid-channel to the first bend. Keep close to the north bank at the bend and until the river opens into a wide, shallow lagoon; pass northward of a beacon and then cross this lagoon in a general southwest direction to a beacon on the west side of an opening in the marsh west of a wide bight extending southward, passing westward of a line of small islets that stretch across the mouth of this bight. The channel across the lagoon is narrow and somewhat crooked, and must be navigated cautiously, especially at high tide. Having crossed the lagoon to the beacon, turn southward and then south-southeastward into a narrow passage, on the eastern side of which, $\frac{3}{4}$ mile distant, there is a small but prominent hammock of palms and other trees. Follow this passage $1\frac{1}{2}$ miles to Fripps Inlet, which opens straight to seaward, and then turn to westward into Story River.

The channel through **Story River** is easily followed; it holds straight through past several sloughs on the northern side. The mouth of the river at Trenchards Inlet is obstructed by a sand bar, over which there is 5 or 6 feet at low tide.

When down to the mouth of **Story River** hold straight out, about 247° true (WSW mag.), across the bar and over to the western shore. Follow this shore northward to the point and then westward into **Station Creek**. Steer a mid-channel course to the first bend in **Station Creek**, leaving a creek of nearly the same width on the starboard hand 1 mile from the entrance, and then follow the trend of the northern bank until the creek turns southward. Then keep close to the islets on the western side of the creek for a distance of 1 mile, until the creek turns westward. After making this turn (westward) keep close to the south bank to avoid a mid-stream shoal (dry at low tide), and follow the trend of this shore close around the next bend, passing eastward of an islet south of the bend. After rounding the next bend, below the islet, keep close to the northern shore, to avoid a shoal, and when the stream turns southward again, keep close to the eastern shore, for the same reason; the shoalest water on the route (about 3 feet) is found in this vicinity. Past the latter shoal the channel is easily followed.

At the mouth of **Station Creek**, hold down southward along the shore south of the creek, at a distance of about 200 yards off, until **Horse Island Creek** opens, bearing about 101° true (E by S mag.); then haul out into **Port Royal Sound**. A shoal, partly dry at low tide, extends southwesterly from the shore north of **Station Creek**, and half way between the creeks there is a depth of but 3 feet on it at low tide; the channel is eastward of this shoal and is good for about 8 feet. On the shore, north of and close to the mouth of **Station Creek**, are four tall trees, three of them palmettoes, standing in a row.

PORt ROYAL SOUND TO SAVANNAH.

The distance is 32 miles. **Skull Creek** has ample depth, but its marshy banks are partly covered at high water, and the safest time to take it is at low water. It is marked by beacons and lights.

From the horizontally striped gas buoy on the south end of **Paris Island Spit** steer 272° true ($W \frac{1}{4} N$ mag) for 2 miles to a red buoy and then steer 277° true ($W \frac{5}{8} N$ mag.) for **Skull Creek** light (white structure) on the north side of the entrance to the creek, and give the south bank a berth of over 300 yards. When about 300 yards from the light haul in for the creek, giving the shore on the port hand a berth of 150 yards, and then follow the marsh on the west bank (marked by a beacon at the entrance) at a distance of 100 yards.

Pass in mid-channel westward of light No. 1, and when past it gradually increase the distance from the west bank to 150 yards and pass eastward of the beacon at the turn $\frac{3}{8}$ mile above. Then keep in midstream as defined by the banks and beacons until abreast light No. 5. Then steer about 214° true (SW by S mag.), following the west bank at a distance of 50 to 75 yards and passing about 75 yards westward of light No. 7.

Then follow the south bank at a distance of 100 yards, passing southward of a beacon and drawing in to 50 or 75 yards when passing the oyster factory on that side. There is a store and artesian well

at this factory. Then keep in midstream and favor the west bank at the entrance (locally Bulls Point). Then bring the white range beacons on Bulls Point astern on about a south course and pass westward of a light on a black structure.

Then keep near mid-channel for 5 miles southward in Calibogue Sound to Cooper River, on the west side of the sound. Daufuskie Island range lights are on the west side of Calibogue Sound, southward of the mouth of Cooper River, and the rear light is prominent.

Enter Cooper River favoring the south bank; cross over to the north bank west of Bulls Creek (the second creek on that side); return to the south bank $\frac{1}{4}$ mile before reaching the western end of the marsh on that side, westward of which are a few shacks; and keep near midstream or favor the north bank in approaching Ramshorn Creek, the first opening in the southern bank, visible when up to the marshy point where the river bends from a westerly to a north-easterly direction. There is a clump of tall trees on Page Island, on the north side just inside the entrance of Ramshorn Creek.

Ramshorn Creek is good for about 7 feet at low tide; the tides meet north of Pine Island, a wooded hummock on the west side, and the tidal currents run with considerable strength each way. From Cooper River enter Ramshorn Creek in mid-channel and follow mid-channel courses or slightly favor the outside of the curves through the creek. Two small branches are left on the port side. Steer 158° true (SSE mag.) from the creek, keeping about 200 feet from the east bank and heading for some wharves and buildings. Care is required, especially at the south entrance of the creek.

Then favor the east bank for 1 mile, passing several landings on that side, and then favor the west bank for 1 mile, passing a broad creek on the east side, until up with the creek opening in the west bank 2 miles below Ramshorn. Favor well the south bank in entering this creek, then go westward through the middle of the narrow Walls Cut to Wrights River, then follow the north bank of this river for $\frac{3}{4}$ mile northwestward until approaching Mud River, and then favor the south bank.

Mud River has been improved by dredging to a depth of 7 feet; keep in mid river or slightly favor the outside of the curves. The outlet to Savannah River is at the east end of a training wall and nearly $\frac{3}{8}$ mile westward of the upper one of two slatted beacons (Lower Flats range lights).

From Mud River follow the marked channel of Savannah River for 4 miles westward and northward to the western end of Elba Island; here the inland route turns away from Savannah. To go to Savannah continue westward $3\frac{1}{2}$ miles, favoring the south bank.

Savannah is on the south bank of the Savannah River, 14 miles above its mouth. It is an important shipping port and has railroad connections with all parts of the country and connections by steamships with the principal ports of this coast. Quays extend along the entire river front of the city and for about a mile down river, below the city; in the left bank, opposite the city, are deep slips for cargo vessels. Vessels lying at the quays are exposed to the swash from shipping in the river, and, for this reason, and also because the quays are high above the river, small craft, unless loading stores, usually stop at Thunderbolt or Isle of Hope, both of which are connected with Savannah by electric railway. There is no anchorage

near the city. Provisions and ship chandlery of all kinds, coal, gasoline, and fresh water can be had at the wharves. The facilities for making extensive repairs to hulls and machinery of vessels are good, and there are marine railways, the largest of which has a capacity of 1,500 tons. Storm warning signals are displayed in the city and at Tybee lighthouse and Thunderbolt. The mean rise and fall of tides is 6.5 feet.

SAVANNAH TO BRUNSWICK.

Savannah River to Ossabaw Sound, 23 miles.—Chart 440 is the best guide.

From the Savannah River above Elba Island enter South Channel, passing south of Elba Island through an opening in the training wall which extends partly across from the west end of this island to the mainland. Pass northward of the white dolphin (Mackey Point light) just inside the training wall, and keep close to Elba Island for nearly 1 mile until Wilmington River opens. Then enter on a 167° true (S by E $\frac{1}{8}$ E mag.) course, with two beacons on the south side of Elba Island in range astern, and pass 125 yards off the western side of the entrance; this leads through a dredged channel 200 feet wide with a least depth of 9 feet or more across the shoal in South Channel.

In general, keep near the middle of **Wilmington River**, favoring, if anything, the outside of the bends until approaching Thunderbolt, and then follow the ebb tide bends. Pass through a railroad drawbridge (draw openings 78 feet) near the entrance, leave St. Augustine Creek on the port hand $\frac{3}{4}$ mile from the entrance, and Habersham Creek on the starboard hand 1 mile farther; just eastward of Habersham Creek favor well the north bank. When 2 miles past Habersham Creek take the passage leading westward, passing northward of a small island. When approaching Thunderbolt keep to the east side of the river until down nearly to the bend.

Thunderbolt is a small village and pleasure resort on the west bank of **Wilmington River**. The **Savannah Yacht Club** is here, and yachts and small craft usually stop here rather than at **Savannah**. There is good anchorage in the river, and small wharves with depths of 3 to 4 feet at low tide. An electric car line connects with **Savannah**. Gasoline, fresh water, and some provisions can be obtained here. There are boat-building and repair shops, and marine railways of about 40 tons capacity.

Leaving Thunderbolt favor the south bank to **Herb River**, 1 mile downstream; then cross over to the north bank and work back to midstream $\frac{1}{2}$ mile below. Two miles below Thunderbolt, **Skidaway River** enters **Wilmington River** from southward, and from here there are two routes to **Vernon River**. The shorter, deeper, and easier passage is by way of **Skidaway River** and **Narrows**, and it is the only one recommended to a stranger.

Favor the east bank of **Skidaway River** for 1 mile to the first bend, then the north bank to the next bend at **Grimball Creek**, then the south bank to the eastern one of the two creeks which enter from southward at the next bend, and then the north bank to and nearly around the next bend at **Isle of Hope**. Then follow the east bank closely for 1 mile until on range No. 1 at the north end of **Skidaway Narrows**.

Isle of Hope is a pleasure resort on the north bank of Skidaway River. It is connected by electric railway with Savannah. Gasoline and provisions are obtainable, and there are railways for small craft.

Skidaway Narrows should be taken by a stranger on a rising tide. It has been improved by dredging a crooked channel 100 feet wide and 7 feet deep. The channel is marked by pairs of range beacons, ahead when bound southward; each front beacon is a single pile with a diamond-shaped target and each rear beacon is a tripod with a circular target, both having the same range number. At the turns from one range to another the inside of the angles has been widened slightly. Range beacons Nos. 1 to 8 mark the channel continuously for about $\frac{1}{2}$ mile; the channel is then in the middle of the creek for nearly 1 mile southwestward until abreast the last opening on the north side about $\frac{3}{8}$ mile eastward of Cedar Hammock Creek. Range beacons Nos. 9 and 10 then guide past Cedar Hammock Creek.

Favor the west bank in the bight and then be guided by the range beacons (circular day marks). The last beacon is on a marsh island in the entrance of Back River; there is a depth of about 7 feet on this crossing. Follow the east side of the marsh island at a distance of 50 yards nearly to its lower end, below which the channel is not difficult. Then cross over and follow the east and south bank around the bend, then near the middle until approaching the settlement of **Vernon View** on the north bank, and then the north bank past the settlement.

Keep in midchannel nearly around the next bend to **Vernon River**, then follow the east bank for $1\frac{3}{4}$ miles to Little Ogeechee River, and then keep near mid-river. Light-draft craft can follow the eastern shore of Little Don Island at a distance of 150 yards to **Hell Gate**, passing westward of the long shoal off the island; or vessels can take the broader passage eastward of the shoal and approach Hell Gate from eastward.

Favor the east side (**Raccoon Key**) in Hell Gate, steer 190° true (S $\frac{7}{8}$ W mag.) with the eastern edge of Little Don Island astern, and pass 200 yards off Raccoon Key where its shore turns sharply southeastward.

Ossabaw Sound to St. Catherines Sound, $13\frac{1}{2}$ miles.—From the southwest point of Raccoon Key turn westward, give the point of the mainland on the west side of the passage a good berth, and then follow the north bank of Ogeechee River closely in the bend northward and westward of Middle Marsh (two marshy islands) to a prominent clump of palmettoes; there is said to be a depth of 4 feet or more through the passage leading between the marshy islands. Then favor, if anything, the north bank to **Florida Passage**, the first break in the south bank of Ogeechee River.

Enter the north end of **Florida Passage**, favoring a little the western side, and then hold about to mid-channel for 2 miles to **Bear River**, which it enters about at right angles. At this point in Bear River there is a middle ground, bare at low water; there is a narrow channel with a depth of about 4 feet northward of the middle ground, to go through which follow the north bank at a distance of 250 feet; this channel will probably be dredged to a depth of 7 feet. The better channel at present, with a depth of about 6 feet, is eastward of the middle ground; to go through this channel follow the east bank at the south end of **Florida Passage** at a distance of 125 yards, cross to the

south bank on a range of two private beacons, and then follow the south bank westward at a distance of 125 yards. Then follow the ebb tide bends down Bear River, as shown on chart 156, and enter St. Catherines Sound near the wooded south end of Ossabaw Island to avoid the extensive shoals on the west side at the mouth of the river and in the sound.

St. Catherines Sound to Sapelo Sound, 12½ miles.—From this point there are two routes. The deeper and shorter route leads eastward of a red and black horizontally striped buoy $\frac{3}{8}$ mile southwestward of the south end of Ossabaw Island, then about southwest by west (mag.) for 1½ miles to a position eastward of a horizontally striped buoy, then southwestward into North Newport River for 1½ miles to a black buoy on its south side, then favors the southeast side of North Newport River to the western end of Walburg Creek. This route is used by deep-draft local vessels, but it leads close to unmarked shoals on either side, and there is said to be a strong current on the ebb tide.

The other route, leading through Walburg Creek, has a depth of about 6 feet. It leads across more exposed waters in St. Catherines Sound and is 1 mile longer, but is easier to follow and is often preferred by small craft, and by vessels on an ebb tide. Pass eastward of the red and black horizontally striped buoy $\frac{3}{8}$ mile southwestward of the south end of Ossabaw Island, and close to the red and black horizontally striped buoy $\frac{1}{2}$ mile southwestward of the first. Then follow the wooded shore of St. Catherines Island southward into Walburg Creek, avoiding the shoal on the west side of the creek mouth. Favor the west bank for $\frac{3}{4}$ mile, then the east bank past the landing on that side and around the bend, then follow the north bank closely nearly to the next bend, and then favor the south bank until past the creek on the opposite side. West of here Walburg Creek widens and the channel is close to the north bank; take care to avoid the eastern end of a middle ground, and when westward of the middle ground do not pass too close to the north point at the western entrance.

From the western end of Walburg Creek follow the east bank of North Newport River for $\frac{1}{2}$ mile southward and enter Johnsons Creek. Keep about in mid-stream for $1\frac{3}{8}$ miles, and then exercise care in crossing the mouths of two streams which enter on opposite sides. Keep near mid-stream, but avoid the southeasterly extension of the north point of the creek on the west side and the south point of the creek on the east side. Then follow the ebb tide bends as shown on chart 156. There is an oyster cannery, which is a good mark, on a slough on the east side of Johnsons Creek 1 mile above its entrance from South Newport River. The channel follows the west bank in passing the cannery until down to the mouth of the slough on which it is located, and then follows the east bank to South Newport River. The northern side of the southern entrance to Johnsons Creek is a white shell beach, off which shoals extend southward more than half the width of the mouth.

From Johnsons Creek follow the east bank of South Newport River for $\frac{1}{2}$ mile, and from a position 250 yards from the east bank at this point steer 189° true (S $\frac{7}{8}$ W mag.) for $1\frac{3}{4}$ miles to the horizontally striped buoy in Sapelo Sound.

Sapelo Sound to Doboy Sound, 12 miles.—The old route from this point, leading through Mud River and New Teakettle Creek, had shoaled in July, 1916, to a depth of about 5 feet, and will not be dredged. The new route, leading through Front River and a canal and Old Teakettle Creek to a junction with the old route, had a depth of only 4 feet at low water at that time, but was soon to be dredged to the project depth of 7 feet.

From the horizontally striped buoy in the mouth of South New-
port River, steer for the quarantine station (a structure on piles
northward of Sapelo Island), pass $\frac{3}{8}$ mile northward of it and steer
 268° true ($W \frac{1}{4} S$ mag.) for $2\frac{1}{4}$ miles, passing northward of a hori-
zontally striped buoy and to a position northward of a black buoy.
Then steer west-southwestward to a red buoy, leaving it on the star-
board side, and then 233° true ($SW \frac{5}{8} W$ mag.) for $\frac{7}{8}$ mile, heading
for a landing on the west side of **Front River** (marked by a white
shell bank and a clump of trees). From here steer 247° true (WSW
mag.), heading for a red buoy with the north point of the marsh
astern. Pass close eastward of the buoy and follow the channel
southwestward, close along the ends of two wharves, into **Front River**.
The channel here has been dredged 17 feet deep and 150
feet wide. There is artesian water on the northerly wharf.

The best water favors the western side past two openings on that
side, then the eastern side southward to the bend at Sapelo, and
then about in mid-channel through the creek, leaving several small
branches on both sides, and through a straight canal to **Mud River**.
The outlet of the canal into Mud River is marked by a private tripod
on the east side.

From the canal the best water leads about 146° true (SE by S
mag.) for $\frac{1}{2}$ mile, through a narrow channel with shoals on either
side, to the south side of the entrance to **Old Teakettle Creek**. Then
it leads west-southwestward close along the south side of Old Teakettle
Creek for $\frac{1}{2}$ mile. The best water then favors the western
side southward for $\frac{1}{2}$ mile to the broad part of the river, then crosses
this on a 156° true ($SSE \frac{1}{8} E$ mag.) course, with an islet a very
little on the starboard bow. The least depth is about 7 feet, and
there are shoals close to the channel on either side. Pass 100 yards
eastward of the islet and continue southward in Old Teakettle Creek,
keeping in mid-channel until approaching the mouth of New Teakettle
Creek, then favoring the south side to the bend and then the
east side to Doboy Sound, and then steer southward for the red buoy
at the entrance of North River.

Doboy Sound to Altamaha Sound, $6\frac{1}{4}$ miles.—Leave the red buoy
which marks a shoal on the western side of the mouth of North
River on the starboard hand and enter **North River**, favoring the
western bank until abreast of the north end of Doboy Island. Then
favor the shore of Doboy Island and pass 75 to 100 yards off the
south end of this island. **Doboy Island** is wooded, and there are
several ruined buildings on its southwestern end.

Leaving North River at the southwestern end of Doboy Island,
cross Back River on a 181° true (S mag.) course and favor the
eastern bank to South River, passing Darien and Rockdedundy
Rivers on the starboard hand; the point on the east bank opposite
Rockdedundy River should be passed at a distance of 40 to 50 yards.

At **South River**, which runs eastward to Doboy Sound, follow the western bank southward into **Little Mud River**, keeping well over to westward to avoid a shoal on the south side of the entrance to South River. Then, when well into Little Mud River, follow its eastern bank at a distance of 200 feet to Altamaha Sound, and then follow the north shore of Altamaha Sound eastward at a distance of 150 yards to a red beacon on the shore.

Altamaha Sound to St. Simon Sound, 19 miles.—From the beacon stand southward until 500 to 600 yards from the north shore, and then stand westward for $\frac{3}{4}$ mile with beacon No. 1 broad on the port bow, then southwestward to pass about 50 yards westward of beacon No. 1 and the west shore of that island. Then follow the south shore of the sound westward for 1 mile, and then cross to the point of the marsh island at beacon No. 4.

Pass 150 yards southward of beacon No. 4, steer 300° true (NW by W $\frac{3}{8}$ W mag.), heading a little southward of the east point of Broughton Island, and then follow the northwest shore of **Buttermilk Sound** at a distance of 150 yards until about $\frac{1}{4}$ mile past beacon No. 6. Then cross Buttermilk Sound, where the least depth is 7 feet, on a 152° true (SSE $\frac{1}{2}$ E mag.) course with the points of the narrower part of the sound just open ahead. Pass 75 to not over 100 yards off the first point on the east side, and then follow that side at a distance of 100 yards until approaching the entrance of two creeks.

Pass the first creek in mid-channel and then haul in for the east bank southward of the second creek, following it at a distance of 100 yards. Pass 125 yards off the mouth of the next stream on the east side (opposite the north side of the broad opening to Mackay River on the west side), steer 211° true (SSW $\frac{3}{4}$ W mag.) for the eastern side of the entrance to **Frederica River**, following the east bank at a distance of 150 yards to a position favoring the east bank just northward of the next stream on that side, and then enter the river in midstream. The channel is narrow and care is required in the southern part of Buttermilk Sound.

Keep in the middle of **Frederica River**, favoring if anything the outside of the bends, some of which are sharp. Great care is required at the sharp point about halfway through the river and $\frac{3}{4}$ mile below the old fort, built by Oglethorpe, on the east side. Follow the south bank on the north side of the point until approaching the bend, and then edge out to mid-channel to allow room for making the turn. Then haul sharply southeastward and follow the southwest side of the point at a distance of 150 feet until over 300 yards below the point to avoid a shell bank with little water over it.

Keep in midstream for 2 miles below this point until the river begins to widen. Then follow the east bank at a distance of 150 yards until nearly down to the point opposite the broad opening to Mackay River.

From this point there are two possible routes to the inland waterway leading southward from **Brunswick Harbor**. The deeper, shorter, and broader waterway, and the one always used by boats not stopping at **Brunswick**, is to follow the east bank of **Frederica River** at a distance of about $\frac{1}{8}$ mile, past the broad opening leading westward into **Mackay River**, and follow the west bank at a distance of 150 yards to the next bend. Then follow the eastern bank to **St. Simon Sound**, leaving a horizontally striped buoy on the starboard

hand. Then stand southward across St. Simon Sound to buoy No. 16, in the entrance of Brunswick River. From here steer 215° true (SW by S mag.) for 2 miles, with the Jekyl Island range (white structures) ahead to the mouth of Jekyl Creek.

A depth of about 7 feet at low water can be taken to Brunswick through Mackay River, Clubbs and Plantation Creeks. From Frederica River at the opening into **Mackay River**, steer about southwest for a tank and tall chimney at Brunswick, and pass 250 yards westward of the northwest end of the island between the two rivers. Favor the eastern bank of Mackay River to the first point (marked by a hammock of bushes), and then the western bank to the mouth of the river. Give the point between Mackay and Back Rivers a berth of about $\frac{1}{4}$ mile and turn westward into **Back River**. Enter Clubbs Creek, the first bold creek on the southern side of Back River, about $\frac{1}{2}$ mile from the mouth, and keep in the middle of this creek for about 500 yards to a canal through the eastern bank. Pass through the canal into **Plantation Creek**, passing close to a skeleton tower, and turning southward, keep about in the middle of this creek. When the creek forks, take the southern fork (left hand) to a canal through its western bank. Leaving this canal, turn southward through a short section of the western fork to Brunswick River. To go to Brunswick, turn westward and then northwestward into Brunswick Harbor. The above route is good for 7 feet at mean low tide, and the least width it 50 feet in the canal.

Brunswick is on the left bank of Brunswick River, $7\frac{1}{4}$ miles above St. Simon Lighthouse and $4\frac{1}{2}$ miles off the track of the inside passage southward. It is an important shipping port, and has railroad connections with interior and seacoast cities and steamship connections with coast cities; river steamers connect with Ferandina and Darien.

There are extensive wharves suitable for vessels of all sizes; and coal, water, gasoline, supplies, and ship chandlery can be had. There is one shipyard at which repairs to hulls and machinery can be made. It has one marine railway of about 500-tons capacity for vessels of 7-feet draft forward and 13 feet aft, and a small railway for launches. Storm warnings are displayed from a tower in the city.

BRUNSWICK TO FERNANDINA.

St. Simon Sound to St. Andrew Sound.—If not going to Brunswick, follow the directions, as previously described, to the mouth of Jekyl Creek. Or, from Brunswick, follow the wharves southward until past the large wharves at the south end of the city, give the north shore a berth of $\frac{1}{4}$ mile until off the quarantine station, then steer about 114° true (ESE mag.) to a position $\frac{1}{4}$ mile northward of the end of the jetty at **Jekyl Creek**; this jetty is on the west side of the dredged channel into the creek and is marked at its end by Jekyl Island range front light. Stand through the dredged channel on the **Jekyl Jetty range** (lights on pile structures), following the jetty at a distance of 100 feet, pass 200 feet northeastward of the front light and stand through the narrow part of the creek in midstream until range beacons No. 3 (triangular targets) are in line astern. Hold this range until range beacons No. 2 (triangular targets, showing a little

to the right of a cupola) are in line ahead, and then stand on this range until beacons No. 1 (square targets) are in line astern. Hold the last range to the middle of the creek. The dredged channels, marked by these range beacons, have a depth of 7 feet or more, and lead between flats that are partly bare at low water; a training wall, partly covered at high water, lies westward of the northern part of the dredged channel.

Then keep near midstream for $\frac{1}{2}$ mile until abreast the wharves and settlement on the east side, and then follow the east bank to Jekyl Sound. Then follow the eastern shore at a distance of 300 yards to St. Andrew Sound, at the south end of Jekyl Island. Then cross St. Andrew Sound, course 146° true (SE $\frac{7}{8}$ S mag.), for $1\frac{3}{4}$ miles to a position eastward of St. Andrew Sound light (skeleton structure in the mouth of the Sound); the light is about in range with the outer edge of the beach on the south side on this course. Then steer southward to pass westward of the wooded north end of Little Cumberland Island, marked by an unused lighthouse.

St. Andrew Sound to Cumberland Sound, $20\frac{1}{2}$ miles.—Passing about 300 yards off the west side of the north end of Little Cumberland Island, steer about 207° true (SSW $\frac{3}{8}$ W mag.), heading for the western edge of High Bluff (marked by a clump of trees off the end) and passing about 300 yards off the point of marsh on the west side of Cumberland River; and then steer so as to pass 200 to 300 yards off the marsh on the east side southward of High Bluff and landing. Follow the east bank at this distance until abreast the point of woods on that side, and then cross the entrance of Brickhill River (a broad opening leading southward) on a 243° true (SW by W $\frac{1}{2}$ W mag.) course to a position 150 to 200 yards from the south bank. Then cross to the west bank eastward of Shellbine Creek; a group of houses on Shellbine Creek are nearly ahead on this course.

Follow the west bank, keeping about 150 yards off until past the creek, then about 200 yards until this bank bends westward, then about 100 yards in rounding the point, 200 yards at the head of the bight northward of Cabin Bluff wharf, and then about 100 yards to the end of the woods 300 yards southward of Cabin Bluff wharf.

Then cross gradually to the east bank and follow it at a distance of 150 yards, drawing in to 100 yards when passing the middle ground, bare at low water. When abreast a grassy islet near the west bank head over for the west bank just northward of Delarache Creek and follow that side at a distance of 100 yards for about $\frac{3}{8}$ mile. Then cross over gradually to the east bank about $\frac{1}{2}$ mile farther down, and follow it at a distance of 100 yards until abreast the north end of a marshy island.

Three range beacons, the front one being common to both ranges, will then be seen on the east bank southward of the opening into Brickhill River. Follow the eastern bank until the first range (red targets, No. 2) closes, and then keep this range until 200 feet from the east bank. Then follow this bank at this distance until range No. 1 (white targets) is closed astern, and then follow this range past an islet which is left on the port hand and until approaching an islet which is left on the starboard hand, and then keep southward of the range. Pass 400 feet eastward of the islet and steer 213° true (SSW $\frac{7}{8}$ W mag.) until about 150 yards from the west bank.

Then bring the edge of the marsh on this side astern on a 180° true ($S \frac{1}{8} E$ mag.) course and cross to the west side of the large island on the east side of **Cumberland Sound**, which is passed at a distance of about 150 yards. Then steer 175° true ($S \frac{1}{2} E$. mag.) and follow the western side of the next long, low, grassy island at a distance of 100 to 150 yards. A smaller island will be seen ahead; follow its west side at a distance of 100 yards until abreast its middle, and then steer 187° true ($S \frac{5}{8} W$ mag.) to a position 200 yards eastward of the north end of a small island.

Stand southward to a position about 250 yards eastward of the middle of the island and steer 158° true (SSE mag.) and then 141° true ($SE \frac{1}{2} S$ mag.), following the eastern shore of **Cumberland Sound** at a distance of $\frac{1}{4}$ mile. The last course will lead to the horizontally striped buoy at the entrance to **Amelia River**, from which stand southward, following the eastern bank to **Fernandina**.

Fernandina is on the east bank of **Amelia River**, 2 miles southward of **Cumberland Sound**. It is a shipping port for lumber and naval stores and is connected by steamboat with **Brunswick** and **St. Marys**. One railroad enters the city. The wharves extend for about a mile along the river bank and have deep water up to them. Coal, fresh water, and gasoline can be had at the wharves. Provisions and some ship supplies can be had here. There are no facilities for making repairs to vessels, but minor repairs to machinery can be made. Storm warnings are displayed from a tower in the post-office yard.

FERNANDINA TO ST. JOHNS RIVER.

The inside passage between **Fernandina** and **St. Johns River** has been dredged 7 feet deep and 100 feet wide and many cut-offs have been made. The channel is marked by beacons and lights and is easily followed, except at a few points. The mean rise and fall of tides is 3 to 6 feet, depending upon the place. Chart 577 is the best guide for the inland passage, and also for **St. Johns River** from the mouth to **Jacksonville**.

Follow the eastern bank past the city of **Fernandina**, and when abreast the most southerly wharves bring them astern on a 265° true ($W \frac{1}{2} S$ mag.) course to a position midway between two marshy points, and round the bend to southward. Pass one creek on the port hand, one on the starboard, and enter **Kingsley Creek**, the second creek on the port hand, marked on the east side by a beacon. Pass through a cut-off $\frac{1}{4}$ mile south of the entrance to the creek. A highway bridge and, about 200 yards south of it, a railroad bridge, cross **Kingsley Creek**; both have draw openings of sufficient width for any of the vessels using the waterway. **Kingsley Creek** enters **South Amelia River** $\frac{1}{4}$ mile below the railroad bridge, and from here southward for 2 miles a narrow channel winds through shoals and marshy islets. It is the most difficult section of the route. At low water the shoals on each side are well defined, and this is the best time to cross this section, but strangers of 5 feet or less draft, should have little trouble in crossing at any time with the aid of the chart and the marks. Day ranges bearing letters, used in the dredging, were also in place in 1916. Red marks and even numbers are left to starboard, and black marks and odd numbers to port when bound southward.

Having followed the channel until past Light No. 7, hold southward to the marsh on the starboard hand, and follow it eastward to a small settlement on the eastern shore. Then follow the east bank southward, past a small creek, and westward to the turn, following the beacons. Cross over to the west bank here, and follow it to the next bend, $\frac{1}{2}$ mile below.

Favor the east bank below there until nearly to the mouth of the creek, and then the west bank to its end in **Nassau Sound**. A shoal extends $\frac{1}{4}$ mile southeast from this point. When clear of this shoal, hold down the sound in mid-channel for a distance of 1 mile below the point. Then follow the western shore at a distance of 200 yards, from abreast the northern end of a sparsely wooded hammock, watching out for the middle ground shoal on the port hand, and pass the entrance to **Sawpit Creek**, $1\frac{1}{2}$ miles below South Amelia River, keeping 500 yards off the shore south of the creek until that distance below the entrance, and abreast a light on the western side. Then haul westward to the light, and follow the shore northwestward into **Sawpit Creek**.

Keep about in mid-stream to the first bend, slightly favor the southeast side after rounding the bend, and then about in mid-channel through this reach. Then bring a pair of range beacons in line astern and haul across westward to the next bend. The best water then follows about in mid-creek, except at one point, where there are range beacons, to a set of range beacons on the eastern bank, where the creek turns west-southwestward. Bring these beacons in line astern for 350 yards and then follow the north shore 50 yards off until on the second range. From this point to St. Johns River the channel has many cut-offs and is marked by beacons at the turns and by day ranges used in the dredging.

Haul southward for **Gunnisons Cut**, and keep the beacons in line astern until through the cut and the creek bends eastward. Keep in mid-stream for $\frac{1}{4}$ mile and then continue south-southeastward for $\frac{3}{8}$ mile through three cut-offs, and at the last cut-off hold straight ahead, leaving an opening to right and left, to a place where one passage runs eastward and another broader one southward. Take the southerly passage and follow it past an opening to port to **Fort George River**, which trends southeastward to the inlet of that name.

Pass this river, following the western bank into **Sister Creek**, and keep in mid-stream for $\frac{3}{8}$ mile to a cut-off. Go through this, then southward in the creek for $\frac{1}{4}$ mile, and then through two more cut-offs. Then favor the western side of **Sister Creek** for $\frac{1}{4}$ mile to the entrance of a canal on the south side of a broad opening leading southeastward. Follow the canal for 1 mile, to its outlet into **Sister Creek**, then follow the main stream, leaving several branches on either side, for $\frac{7}{8}$ mile to within $\frac{3}{8}$ mile of its outlet into **St. Johns River**, where there is a short cut-off through the point on the south side; strangers should proceed with caution in this section, as there are shoals close to the channel on either side; lettered day ranges used in the dredging were in place in 1916. Go through the cut-off, haul south-southwestward for 200 yards, and then bring two range lights (white structures) on the north side of the creek in line on a southerly course to the main channel of **St. Johns River**. These range lights and a red structure on the shore just south of the entrance are the distinguishing marks for entering the waterway from southward.

The distance from Fernandina to St. Johns River by the inside route is about 26 miles.

For vessels bound to Mayport or Jacksonville, chart 577 is the best guide.

Mayport is on the south bank of St. Johns River, 1½ miles below Sister Creek and ½ mile above St. Johns River lighthouse. Storm warnings are displayed from a tower visible from the river. There is daily communication with Jacksonville by railroad and by river steamboat. Coal and fresh water can be obtained at the railroad wharf. Gasoline can be had in small quantities. There is no public wharf and mooring at the wharves is forbidden without permission. There is a good place to beach a small craft just below the lowest wharf; the bottom is hard sand and smooth but so steep that boats should lie parallel with the shore; the average rise and fall of tides is 4.2 feet.

Jacksonville is on the north bank of St. Johns River, about 23 miles above the ends of the jetties. Extensive wharves extend along the north bank and are convenient for large and small vessels. Coal, gasoline, and fresh water can be taken conveniently at the wharves. Provisions and ship chandlery of all kinds are obtainable. The facilities for making repairs to hulls and machinery are excellent, and there are marine railways for hauling out large vessels, and motor boats. Pilots for the inland waters can be had here. There are several wharves where yachts and motor boats may tie up by paying wharfage, some of them being near the foot of Main Street, in the vicinity of the ferry wharf.

ST. JOHNS RIVER TO MIAMI.

From St. Johns River to Miami, on Key Biscayne Bay, there is a continuous inside waterway through canals and natural channels, in which the controlling depths vary from 4 to 7 feet. The waterway is dredged to a depth of 5 feet, but some sections are subject to considerable shoaling and are redredged at irregular intervals. Four feet, or even a little less at times, is the greatest depth that can ordinarily be expected through the waterway at all times, but power boats drawing 4 feet and even a little over, are able, under favorable conditions, to drag through the very soft bottom at the shoalest places. The section from a few miles below Eau Gallie to Jupiter Inlet has been improved under a Government project to obtain a depth of 5 feet, and this depth existed in 1916. Charts 158 to 165, inclusive, are the best guides, and are practically necessary for strangers.

These waters are nontidal, except in the vicinity of the inlets, but are affected to a considerable extent by strong northerly and southerly winds, which may alter the surface level as much as 2 feet in places. A stranger should have but little difficulty in taking through a draft up to 3 feet, except, perhaps, at a few places; but, for a greater draft, he should employ a pilot over parts of the route at least. Pilots for a part of the distance can be had at Jacksonville, Mayport, St. Augustine, and many other places along the route. Supplies, fresh water, and gasoline can be obtained at convenient distances, and repairs can be made at several places along the route; but coal is scarce between St. Augustine and Miami and

can be had only by arrangement with the Florida East Coast Railroad.

Strangers whose draft will permit going inside seldom enter or leave any of the inlets, but keep inside for the entire distance.

Aids to navigation.—The inland waters are well marked by channel stakes as far south as Jupiter Inlet, but below this there are few Government marks until one gets to Miami. The usual type of channel stake is a palmetto pile with red or black finger board and number; but some are iron pipes with finger boards painted but not numbered. Going south, the black boards and odd numbers are left to port and the red and even numbers to starboard. Except where otherwise stated hereafter, the stakes are passed close-to on the side indicated as above. Besides the Government stakes described above and south of Jupiter Inlet, where there are very few Government stakes, there are privately established marks, consisting of a pile or stake with a finger board pointing to the best water. These boards may or may not be colored, but generally are white, regardless of the side of the channel which they mark.

Bridges.—There are numerous bridges crossing the waterway between St. Johns River and Miami, all with draw openings. Those with openings less than 40 feet wide are a bridge at Daytona, width 36 feet; a bridge across the canal between Lake Worth and Hillsboro River, width 39.5 feet; and a bridge across the canal just south of Hillsboro Inlet, width 37.2 feet. The signal for all bridges is two long and two short blasts.

Toll.—Toll chains are maintained at six points between St. Johns River and Miami, as follows: No. 1, between St. Johns River and St. Augustine; No. 2, near head of Halifax River; No. 3, at the canal connecting Mosquito Lagoon and Indian River; No. 4, between Jupiter Inlet and Lake Worth; No. 5, between Lake Worth and Hillsboro Inlet; and No. 6, 4 miles north of the head of Biscayne Bay. The toll each way is 10 cents per foot of length for the first chain, and 5 cents per foot of length for each additional chain.

ST. JOHNS RIVER TO ST. AUGUSTINE INLET.

The distance is 34 miles and the least depth about 5 feet. The approach to the canal leading to the inside waterways south of St. Johns River is by way of Chicopit Bay, which is reached by passing inside of the training wall at Great Marsh Island, about south of Sister Creek. The rear beacon of the Mile Point lower range stands on the training wall $\frac{3}{4}$ mile eastward of its end. Pass 100 yards westward of the end of the training wall and keep close to it until opposite the east end of the little island southeast of Great Marsh Island; then cross to the little island and follow closely its northern shore westward to a cut through the middle of the island. Steer south-southeastward through this cut, and continue straight ahead to the mouth of a canal.

This canal extends southward, nearly parallel to the coast, for about 17 miles to Tolomato or North River; it is 50 feet wide on the bottom and about 5 feet deep at mean low tide. Beginning in Chicopit Bay, near the mouth of Pablo Creek, it follows, in general, the old creek bed for about 8 miles, but leaves the creek frequently to cut across wide bends in the old bed. A highway bridge crosses

the canal about 3 miles below Chicopit Bay and a railroad bridge about 2½ miles farther down; both have draw openings of ample width.

To the railroad bridge the channel is indicated by the evidences of dredging, but for a distance of 3½ miles southward from the railroad bridge, the canal follows more open waters, with many branches on each side, and care is necessary to keep in the channel.

From the railroad bridge continue southward for $\frac{1}{8}$ mile until the river widens, then swing to starboard, leaving a double opening on the port side and an opening and a row of islets to starboard, then enter a short cutoff, with the draw nearly astern. A short distance beyond the cutoff is a short canal leading to a landing from northward, and joining the main canal southward of the landing; take the left branch at this point. About $\frac{1}{2}$ mile below, the canal opens into an open body of water; the best water follows the marsh on the starboard side for a short distance, then holds across in the middle for the southwest end. Just beyond the outlet from the body of water the waterway leaves a branch on each side, and enters the canal straight ahead. Run through this canal, then follow the woods on the starboard side past a landing, leaving an opening on the port side, then swing to port and go through a short cut-off, then swing to starboard around a wooded point.

After leaving the old creek bed the canal cuts through high wooded ground for about 6 miles and then for 2 miles through marsh, and extends in a series of long straight reaches connected by easy curves. There is a highway drawbridge and toll chain 2 miles north of its outlet into North River. The southern entrance is easily recognized by dry sand banks on each side. There are no channel stakes in the canal, the only guide being the evidence of dredging on the banks. Tidal currents amounting to 2 knots are encountered at the railroad bridge; they set north with ebb tide.

The Tolomato or North River flows southward 14 miles from the canal mouth to St. Augustine Inlet, and varies in depth from 5 to 30 feet at low tide. The channel is sufficiently marked by stakes and is easily followed with the aid of charts 158 and 159. The best water leads southward of a wreck in midchannel 2½ miles below the outlet of the canal. The best water favors the west side from the point 1 mile south of Guano River (opening eastward) to the next point, then the east side for 1 mile. There is a light (No. 20) at the mouth of the river northwestward of St. Augustine Inlet, and there are stakes showing the channel to St. Augustine, which passes eastward of the light, then follows the west shore to the city.

St. Augustine Inlet is used by local boats and to a small extent by yachts bound for St. Augustine; it is marked by St. Augustine light-house and a wireless telegraph station on the southern side of the entrance. The channel is marked by small buoys and by a perpendicularly striped sea buoy, which are shifted to conform to the best water. Licensed pilots are stationed at the city of St. Augustine and will come out to a vessel in answer to a signal, but the usual practice is to telegraph ahead from the last port. The bar and channel are said to shift frequently and to be impassable during fresh easterly winds. In July, 1916, the depth on the bar at mean low tide was about 5 feet. At that time the channel ran in southwestward, a little

southward of the lighthouse, until close to the beach, and there turned and followed the beach northward into the inlet.

The average rise and fall of tides is 4.5 feet; and high and low waters occur 8 and 19 minutes, respectively, before high and low at Charleston, S. C.

St. Augustine is a popular winter resort for tourists and yachtsmen, and has several fine hotels open during the winter season. A railroad connects with Jacksonville, and there are connections by steamboat through the inside waters in winter; a power boat runs to Daytona three times a week during the tourist season. The channels to St. Augustine from the sea and through the inside waters are well marked by buoys and stakes and present no difficulties for a draft of 6 feet. There is good anchorage abreast of the city in the Matanzas River, both above and below the bridge, through which there is a wide draw. The wharves north of the bridge have depths of 8 to 10 feet across the ends, and most of them are piped for fresh water. The first wharf south of the bridge, a recreation pier, has a depth of 7 feet at its end, but the wharves south of it are in shallow water. Provisions, some yacht supplies, coal, gasoline, and fresh water can be had here. There are facilities for making minor repairs to hulls and machinery and ways for hauling out craft of about 10 tons. Storm warnings are displayed from a tower at Fort Marion.

San Sebastian River flows past the west side of the city of St. Augustine and empties into Matanzas River 1½ miles south of the bridge. It is said to have a depth of 4 or 5 feet at the entrance, the best water leading along the north side at the entrance, and 7 feet inside as far as the highway bridge. Supplies may be taken at a wharf on this river on the west side of the city.

ST. AUGUSTINE INLET TO MOSQUITO INLET.

The distance is 57 miles and the least depth about 4 feet.

Matanzas River trends southward from its junction with North River at St. Augustine Inlet, past the city of St. Augustine, for about 15 miles to Matanzas Inlet. The channel through the broader section of the river is very narrow and winds between shoals, but it is well marked by stakes and requires no directions with the aid of chart 159. The most confusing place is 3½ miles north of Matanzas Inlet, where the channel turns abruptly westward from the eastern shore, and then southward, between islands on either side.

Matanzas Inlet has a least depth of 6 feet on the bar at mean low tide; but the channel in the mouth of the inlet is obstructed by a ledge of rock, over which the depths vary from 2 to 9 feet. Strangers should not attempt to use this inlet.

A canal runs southward from Matanzas Inlet for 21½ miles to Halifax River and parallels in general the coast line. It varies in width from 60 to 100 feet at the water level, and is comparatively straight, except near the lower end. Where it traverses broader waters the canal limits are shown clearly by banks of dredged material, often above the water level. A highway drawbridge crosses the canal 1½ miles north of Halifax River. There is a toll chain at the bridge. Tidal currents are experienced for a distance of about 6 miles south of Matanzas Inlet, and below there a current usually sets southward, regardless of the tide. It has a strength of about 1 knot.

The least depth from St. Augustine to Halifax River is 4 to 5 feet; but the depth in the canal is affected to a considerable extent by strong northerly and southerly winds.

Directions.—From the old Spanish fort on the western bank of Matanzas River, near Matanzas Inlet, keep close to the eastern shore nearly down to the inlet, and then cross over to the beacon in the southwest corner of the inlet. Leave this beacon 50 feet on the starboard hand and haul southwestward into the canal, taking care to avoid getting into the old channel, which runs south. No further instructions are necessary until one gets to Halifax River. The lower part of Halifax Creek is marked by white handboards on the side of the best water.

Halifax River for 5 miles northward of Mosquito Inlet, into which it empties, is a narrow stream, winding through marshes; but northward of there for 15 miles it is a shallow lagoon, about $\frac{1}{2}$ mile wide, separated from the ocean by a strip of wooded beach from $\frac{1}{4}$ to $\frac{1}{2}$ mile wide. A draft of 5 feet can be taken up to Daytona, about 10 miles above the inlet. Six drawbridges cross the river, the least width of draw opening being 36 feet. The mean rise and fall of the tides at the inlet is 2.3 feet and at Daytona about 0.7 foot; but river tides are influenced to a considerable extent by strong northerly and southerly winds.

Directions, Halifax River.—On leaving Halifax Creek the waterway follows a cut along the edge of the marsh on the eastern side of Halifax River for about 2 miles, and is plainly marked by spoil banks. The waterway then hauls across to the western side of Halifax River on a southerly course, and then gradually works over to the eastern side. The channel here is narrow and is subject to shoaling, but the bottom is soft, and boats of $4\frac{1}{2}$ feet draft can usually drag through. It is marked by beacons and numerous smaller stakes maintained by local people, all on the east side in 1916. Slightly favor the eastern shore, hauling in to 150 yards at the last boathouse on this shore, and when abreast of this boathouse head for the draw in the Ormond Bridge.

Ormond is a small town at the west end of the bridge, and there is a large hotel at the east end. There is a depth of about 3 feet at the wharves on either side of the river and 4 feet at the railroad wharf, just westward of the draw. Gasoline, provisions, and water are obtainable.

After leaving the bridge continue southward about in mid-channel, following the beacons. There is a spoil bank, awash in places, along the east side for about 1 mile south of the bridge. About $1\frac{1}{4}$ miles above the next bridge another dredged channel, with a spoil bank on the side, begins. Go through this, following the beacons and spoil bank, then head for the draw in the bridge. Pass through the first three drawbridges and westward of a spoil bank and beacon below the third, then haul eastward for the fourth draw, which is near the eastern end.

The channel to Daytona is south of this bridge; see description of Daytona. South of the bridge favor the eastern shore, keeping at first 150 yards off and then gradually increasing the distance to 350 yards when below the next point on the western side. Haul in to 200 yards when 1 mile from the next bridge (Port Orange), and then be guided by the stakes to the bridge. Below this bridge the

channel through the marsh is sufficiently marked by stakes to Ponce Park, on the eastern shore, 1 mile above Mosquito Inlet.

The distance from St. Augustine Inlet to Mosquito Inlet is about 57 miles.

Daytona is a popular winter resort on the western bank of Halifax River, about $9\frac{1}{2}$ miles above Mosquito Inlet lighthouse. It is on the Florida East Coast Railroad and is connected during the tourist season with St. Augustine, Palm Beach, and intermediate points by large power boats carrying passengers and freight. Approach to Daytona is obstructed by a shoal from $\frac{1}{2}$ to 2 feet deep, extending along the entire water front and out to the narrow river channel, which here is near the eastern shore. The wharves are reached by narrow channels which have been dredged through this shoal. The city wharf is about 30 yards southward of the fourth bridge and is reached by a narrow channel 4 feet deep, in 1916, although a contract had been let to dredge it to a depth of 6 feet and width of 80 feet. The channel to the wharves runs parallel to the bridge from the main channel at the draw, and is marked by stakes on both sides. In July, 1916, there was a depth of 5 feet at both the city wharf and the Halifax River Yacht Club wharf, which is south of the city wharf and is reached by the same channel. Provisions, some yacht supplies, gasoline, and fresh water can be obtained here; water is piped to the end of the city wharf. The facilities for making repairs to hulls and to the machinery of power boats are good; and there are ways for hauling out craft up to 100 tons and 5 feet draft.

The mean rise and fall of tides is about 0.7 foot.

Mosquito Inlet, 1 mile southward of Mosquito Inlet lighthouse, is used by small local craft bound for New Smyrna and an occasional stranger, entering for an anchorage. A shifting bar extends about $\frac{3}{4}$ mile seaward, beyond which depth increase rapidly from 3 to 10 fathoms. The channel across the bar shifts position frequently, but maintains a depth of about $6\frac{1}{2}$ feet at mean low tide; it is marked by buoys, and is said to be easily entered with a smooth sea. Inside the inlet the channel branches, one part winding northward through shoals to Halifax River, and the other turning southward to Hillsborough River; buoys and a number of stakes mark the channel to Halifax River; the channels are very changeable and the aids are shifted to conform to the changes. A bar pilot lives at Ponce Park, near the lighthouse, and will come out to a vessel in answer to a signal, if it is seen; but the safest plan is to write or telegraph ahead for a pilot. The average rise and fall of tides is 2.3 feet; high water occurs 1 hour and 41 minutes before and low water 1 hour and 8 minutes before high and low at Old Point Comfort, Va.

MOSQUITO INLET TO ST. LUCIE INLET.

The distance is 129 miles and the least depth about 4 feet.

New Smyrna is a winter resort on the western bank of Hillsborough River 3 miles from Mosquito Inlet. It is on the Florida East Coast Railroad and is a flag stop for boats of the inland waterways. The draft that can be carried to there is limited only by the depth on Mosquito Inlet Bar; the depth at the city wharf is 14 feet. This wharf, which is the first coming from the inlet and is nearly opposite the hotel, is piped for fresh water. Provisions and gasoline can

be obtained here. Pilots for the inland water can be obtained here. There are strong tidal currents in the river abreast the city.

Hillsborough River winds southward about $15\frac{1}{2}$ miles through the marshes to Mosquito Lagoon, and is a narrow, tortuous passage, requiring careful steering and close attention to the channel stakes. One drawbridge crosses the river $1\frac{3}{4}$ miles south of Mosquito Inlet. A draft of 6 feet can be carried for a distance of 8 miles above the entrance; but for the next 3 miles a draft of 4 feet is all that can be taken through at low tide; and there are several places where a slight divergence from the best water will take one into depths of 3 feet. The mean rise and fall of tides here is said to be 1 foot and to occur about 3 hours later than at New Smyrna. The river is well marked by stakes, which are a sufficient guide for a draft of 3 feet; but for a greater draft a pilot should be taken.

Directions.—From the mouth of Halifax River be guided by the stakes and buoys across Mosquito Inlet. The channel here is very changeable, and the chart is of little assistance. Be guided by the aids and the appearance of the water. Then follow the eastern bank of Hillsborough River to the drawbridge, keeping close to this bank; then go north of an island to New Smyrna. The channel is well marked from here up and requires directions only at a few places.

Chart 160 is the best guide as far as Mosquito Lagoon, and 161 beyond. Run about in mid-channel for about 1 mile beyond New Smyrna, then leave a broad opening on the starboard hand and swing eastward, following close along the north side of an island for $\frac{1}{4}$ mile. About $\frac{3}{4}$ mile beyond, the ruins of a wharf on the starboard side are passed, and the waterway leads into the middle one of three openings ahead. Beyond this the waterway follows natural channels for $3\frac{1}{2}$ miles to a point where it enters a canal, extending in two straight reaches for $1\frac{1}{2}$ miles. Beyond this no trouble should be experienced to the head of Mosquito Lagoon, although the last 2 miles is narrow and has little depth.

Mosquito Lagoon is a broad body of water from 1 to 10 feet deep, extending southward from Hillsborough River and connected with Indian River by a short canal, known as the Haulover. A draft of 4 feet can be carried through into the Indian River. The distance from Hillsborough River to the Haulover is about 10 miles. The entrance from Hillsborough River is marked by stakes and by narrow islets of dredged materials on each side of the cut; there is a pile with crossed boards at the turn and a pile marking a rock south of the channel.

Leave the last beacon outside the dredged channel on the port hand and steer about 152° true (SSE $\frac{1}{2}$ E mag.), parallel to the western shore at a distance of $\frac{1}{2}$ mile, until down to the stakes 2 miles from the Haulover. Then be guided by the stakes, but do not head in for the Haulover until the cut opens, bearing 220° true (SW $\frac{1}{2}$ S mag.). There is a beacon at the turn and a high spoil bank on the north side in the approach.

The Haulover is a canal $\frac{3}{8}$ mile long through the strip of high, wooded land that separates Mosquito Lagoon from Indian River. Seen from westward (in Indian River) the cut appears first as a square notch in the foliage, but on near approach the canal is seen; the notch is closed from the beacon on the western side of Indian

River at the turn, but is open $\frac{3}{8}$ mile south of the beacon. Dredged channels 4 feet deep lead up to it at each end, but the land cut is 6 to 11 feet deep. The water level at the Haulover varies as much as $1\frac{1}{2}$ feet from normal level under the influence of strong northerly or southerly winds; northerly winds lower the level here and in the northern part of the Indian River. At such times there is a current through the canal of as much as 3 knots, setting in the direction of the wind. On the southern side of the canal are the homes of several fishermen, and on the northern bank, at the entrance from Mosquito Lagoon, is the post office of Allenhurst, in front of which a wharf extends about 75 yards along the bank; a toll chain is located here. Provisions, gasoline, and fresh water can be obtained here, and sometimes a pilot for the inland waters.

Indian River extends southward along the coast to St. Lucie Inlet, which, measured along the channel, is about 103 miles below the Haulover. It is in general a broad lagoon from 6 to 15 feet deep, although at one place (abreast Grant Island) it shoals to but little over 4 feet. At a distance of 63 miles below the Haulover the river is narrow and is nearly closed by shoals and small marshy islets, through which there is a clear, well-marked, but narrow channel of at least 6 feet depth.

The river is nontidal at a short distance above the inlet, but may vary in depth as much as 2 feet under the influence of strong north-erly or southerly winds. The important towns are on the western bank, on the Florida East Coast Railroad, and are Titusville, $8\frac{1}{2}$ miles; Cocoa, $24\frac{1}{2}$ miles; Eau Gallie, 39 miles; Melbourne, $42\frac{1}{2}$ miles; Fort Pierce, 84 miles; and Jensen, 97 miles from the Haulover.

Directions for Indian River.—From the Haulover follow the channel stakes and spoil banks on each side through the dredged channel, and then steer 226° true (SW mag.) for 3 miles to a beacon 1 mile from the western shore; this beacon is not visible from the Haulover, but is about in line with two white buildings on the west shore, which are visible. Leave the beacon on the starboard hand and steer 181° true (S mag.), heading for Titusville. When 1 mile from the red stake off Titusville haul out to leave it on the starboard hand at a distance of 100 to 200 yards, and if bound for Titusville, hold down on this course until abreast of the wharf before heading in for it.

Titusville.—A depth of 5 feet can be carried to the end of the public wharf; but the shoal, marked by the red stake, extends nearly down to a line running eastward from the wharf. Provisions and gasoline can be had here, and there is a machine shop and a railway for small craft.

From a position 200 yards east of the red stake off Titusville, steer 162° true (S by E $\frac{3}{4}$ E mag.) for about 5 miles to a position 200 yards east of the next stake on the same side; then 169° true (S by E mag.) for about 4 miles to a position 450 yards eastward of the ruins of a wharf on Jones Point; then 167° true (S by E $\frac{1}{4}$ E mag.) for $5\frac{1}{4}$ miles to a stake on the same side, off Magnolia Point; and then 161° true (S by E $\frac{3}{4}$ E mag.) for $1\frac{5}{8}$ miles to position abreast of Cocoa.

Cocoa.—A depth of 6 feet can be taken to the city wharf, which is the most northern of the several wharves. Provisions, some yacht supplies, and gasoline can be had here. There are machine shops here, and a shipyard and railway on the opposite side of Indian River that can haul out most of the boats using the inland waterway.

From the last position continue this course for $1\frac{1}{4}$ miles, or from 200 yards off the wharves at Cocoa, steer 153° true (SSE $\frac{1}{2}$ E mag.), to a position 200 yards west of the stake opposite Rock Ledge. Then steer 157° true (SSE $\frac{1}{8}$ E mag.) for 10 miles, past one stake (close to) on the port hand; and then, to go to Eau Gallie, steer 167° true (S by E $\frac{1}{4}$ E. mag.) for $3\frac{1}{4}$ miles to the wharves.

Eau Gallie.—A depth of $4\frac{1}{2}$ feet can be taken to the railroad wharf, on the Indian River. Gasoline and provisions are obtainable. There is a depth of 5 feet at the entrance of Elbow Creek, on the south side of the town, and 4 to 6 feet inside to several landings. The channel at the entrance is marked by stakes and a light, and leads close along the north side, 25 feet off the light. There is a railway on the creek for hauling out boats of 35 tons, 4 feet draft, and 65 feet length. Water is piped to the wharves.

Melbourne is a village on the west side $3\frac{1}{2}$ miles south of Eau Gallie. A long wharf extends to a depth of 4 feet. Crane Creek, just south of Melbourne, can be entered with a draft of 3 feet, through a dredged channel marked by stakes. Gasoline and provisions are obtainable.

From a position $\frac{1}{2}$ mile eastward of Eau Gallie, steer 157° true (SSE $\frac{1}{8}$ E mag.) for 7 miles, passing a black stake off Fisherman Point on the port hand at a distance of 350 yards; and then haul eastward a little to pass the red stake off Cape Malabar at a distance of 200 yards on the starboard hand. From this stake steer 161° true (S by E $\frac{3}{4}$ E mag.) for 4 miles to a black beacon. Then be guided by the channel stakes with pointers along the dredged channel westward of Grant Island, disregarding entirely the old pile beacons in this vicinity, which no longer marks the best water.

There is an inclosed launch basin at Grant, opposite the upper end of Grant Island, into which a depth of 3 feet can be taken. There is a machine shop here, and a railway in course of construction in 1916. Gasoline and some provisions and ship chandlery are obtainable.

There is an old boiler, the remains of a wreck, on the western side of the channel, about $1\frac{1}{4}$ miles southward of Grant Island. Leave this boiler about 200 yards on the starboard hand and the stake below it about 100 yards on the same side. Then steer 154° true (SSE $\frac{3}{8}$ E mag.) for $8\frac{1}{4}$ miles, keeping about $\frac{1}{2}$ mile from the western shore to Barkers Bluff, which is a prominent white sand bank on this shore, $3\frac{3}{4}$ miles below Sebastian Creek, and pass the islets on the port side below the bluff at a distance of 300 yards. The channel here enters Indian River Narrows, which leads along the eastern shore, eastward of a large group of islands.

When nearly down to the black beacon on the port hand, steer to pass it at a distance of 100 yards, heading for the outer end of the ruins of the wharf at Orchid (on the same side). The channel through the Narrows is sufficiently marked by stakes, which are left close aboard in passing. South of the Narrows the channel as far as Fort Pierce is very narrow, and in places is dredged through shoals, but is sufficiently marked by stakes.

Fort Pierce.—The longest wharf has depths of 5 to 6 feet at the outer end and along both sides, and 5 feet can be taken to it. It is piped to the outer end for fresh water. Provisions, some yacht supplies, and gasoline can be had here. There are facilities for

making minor repairs to hulls and machinery, but no means for hauling out vessels; small boats are hoisted in slings.

Indian River Inlet, 3 miles above Fort Pierce, is entirely closed at present.

Southward of Fort Pierce the river channel is broader and deeper. Keep $\frac{1}{2}$ mile from the western shore for 6 miles nearly to a black beacon, $\frac{3}{8}$ mile from shore in passing this beacon, and then about $\frac{1}{2}$ mile off to the next stake (red), north of Jensen. Southward from Jensen, keep $\frac{1}{2}$ mile from the western shore until the stakes at Sewalls Point are picked up.

Jensen.—A depth of 4 feet can be carried to the outer wharf by steering square in for it, but there are shoals of 3 feet depth on each side of this channel. Provisions and gasoline can be had here. There is a small machine shop and a marine railway of about 10 tons capacity.

St. Lucie Inlet is the entrance from sea to St. Lucie and Indian Rivers and is used to some extent by yachts and fishing boats. The inlet and approach from seaward are partly closed by shoals, which are said to shift frequently. The channel was being improved by dredging in July, 1916, to obtain a depth of 15 feet across the bar on a westerly course to the deep water leading close along the north side. A depth of 5 feet at low water can be taken from just inside the inlet into St. Lucie River.

There are no buoys or other marks from seaward at present, and directions, on account of frequent changes, would be useless. There are no regular pilots stationed here, but sometimes a fisherman can be engaged to bring in a vessel. The mean rise and fall of tides is about 1.5 feet. A channel, well marked by stakes, crosses the head of the inlet from Indian River, past Sewalls Point and the mouth of St. Lucie River, to Great Pocket, on the south side.

ST. LUCIE INLET TO JUPITER INLET.

The distance is 15 miles and the least depth about 5 feet. The older route southward from St. Lucie Inlet was through the arm eastward of Long Point to North Jupiter Narrows, but recently a canal 5 feet deep has been cut through from the head of Great Pocket, on the western side of Long Point, to the head of Peck Lake, thus avoiding the shifting sands in the more exposed part of the inlet.

Cross the mouth of St. Lucie River by the channel indicated by stakes, passing 400 yards eastward of the wharf on the north side and 300 yards eastward of the shore on the south side. Then follow the staked channel south-southeastward through Great Pocket and through the canal from its south end to the head of Peck Lake. Stakes mark the channel in Peck Lake leading from this canal, and also the approach to South Jupiter Narrows, at the lower end of the lake.

South Jupiter Narrows is not difficult, but there are a few shallow places that must be avoided. Just north of the first opening in the eastern bank is a narrow shoal on the other side; $1\frac{3}{4}$ miles below there is a narrow dredged channel marked by a red stake, and below this bend the best water is along the western bank. A highway drawbridge crosses the stream near its lower end.

Hobe Sound and Jupiter Sound are small bodies of water but little over $\frac{1}{4}$ mile wide at the broadest part. The channels through both are well marked by stakes, and careful attention should be given to them, as the bottom in many places is hard sand or rock. At Conch Bar, which joins the two sounds, careful steering is necessary, as there is a hard shoal close to the western side of the channel, but the channel here is well marked.

Hobe Sound is a settlement on the western side at the north end of the sound of that name. Water is piped to the landing, to which there is ample depth in a dredged channel, marked on the south side by piles. A standpipe here is prominent.

Jupiter Inlet is obstructed by a sand bar which shifts with every storm and at one time entirely closed the mouth of the inlet. In July, 1916, it was nearly bare at low water. It is used only by small local boats at high tide. A lighthouse and radio station are on the northern shore of Jupiter River, about 1 mile above the inlet. An oyster bar fills the river west of the lighthouse, except for a narrow dredged cut, which is marked on each side by stakes. The average rise and fall of tides at the inlet is $1\frac{1}{2}$ feet.

JUPITER INLET TO NEW RIVER INLET.

The distance is 52 miles, and least depth 4 feet.

Lake Worth Creek and Canal together are about 8 miles long and connect Jupiter River (1 mile from the inlet) with Lake Worth. For a distance of about 3 miles the canal follows the old creek bed in places, but frequently cuts across bends and intersects many sections of the old creek. Below there the canal extends in a series of straight reaches connected by easy curves. The controlling depth is 4 feet. Tidal currents of 1 knot strength may be found in the canal, and probably there is a rise and fall of from 6 inches to 1 foot.

From Jupiter River, abreast the lighthouse, follow the direction of the stakes westward through the oyster shoal and to the point at the west end of the south shore, 200 yards below the bridge. Round this point and follow the shore on the port hand until into Lake Worth Creek. For the next 3 miles be guided by the evidence of dredging, as shown by low, vegetation-covered mounds on the banks of the canal, and the stakes. Go very slowly, keeping in general to the outer side of the bends and watching out for shoals. After reaching the straight stretches no difficulties will be found. There is a toll chain just before entering Lake Worth.

Lake Worth extends 18 miles southward from the canal entrance, which is $\frac{3}{4}$ mile from the head of the lake and is separated from the ocean by a strip of beach, but 200 yards wide at places. The lake varies in width from $\frac{1}{2}$ to 1 mile and in channel depth from $4\frac{1}{2}$ to 11 feet. The entrance to the canal leading northward is recognized at a distance of over a mile by a white sand ridge at its mouth, and the approaches to this canal and to the canal leading out of the south end of the lake are marked by small stakes. The average rise and fall of tides is said to be from 3 to 6 inches, but the lake is said to have risen 3 feet during a storm.

Lake Worth Inlet cuts through the beach about 3 miles below the northern end of Lake Worth and affords the only direct connection with the ocean. Boats of 3 feet draft can get through on high tide;

the depth on the outer bar is about 1 foot greater than over shoals in Lake Worth. The inlet is used to some extent by fishermen and by small local pleasure boats, but should not be attempted by a stranger.

West Palm Beach is a small city on the west shore of Lake Worth, 7 miles below the northern entrance canal and on the Florida East Coast Railroad. It is connected by railroad and highway bridges and by ferry with the fashionable winter resort of Palm Beach, which is due east from it (between Lake Worth and the ocean). During the tourist season a line of large light-draft power boats ply between Miami, West Palm Beach, and Daytona through inland waterways, stopping at all the important intermediate towns. A depth of 7 feet can be taken to the longest (northern) wharf, and 5 to 6 feet for a considerable distance inshore from its end; there is a depth of 5 feet to the city wharf, which is a concrete wharf just south of the city park. Provisions, gasoline, and fresh water can be had. Repairs to hulls and machinery of launches can be made at West Palm Beach and at Lone Cabbage Island, 1 mile south of the city. At the latter place there is a marine railway said to haul out vessels up to 100 tons and 4 feet draft. Storm warnings are displayed from a tower in the city park.

Directions for Lake Worth.—On leaving the canal at the northern end of the lake be guided by the stakes until clear of the last, and then steer to pass the south end of the island (marked by a house) and the islet below it at about one-third the distance to the western shore. Then steer 181° true (S mag.) for 1 mile, then favor the western shore for $1\frac{1}{2}$ miles through a crooked channel, usually marked by bush stakes, past the two points on that side, and then haul in slowly for the east shore; follow this shore at a distance of 150 yards nearly to the drawbridge. After passing the first draw keep to the eastern side until abreast of the wharves at West Palm Beach. South of the second drawbridge keep about 150 yards west of the islets on the east side and $\frac{1}{8}$ to $\frac{1}{4}$ mile from the west shore for 4 miles, and then favor a little the west side to the canal at the south end of the lake. As the south end of the lake is approached the canal will be recognized by the notch in the foliage. Stakes mark the approach to the canal at the south end and the most prominent shoals in the lake.

This canal extends southward from Lake Worth about $13\frac{1}{2}$ miles to **Hillsboro River**, crossing three small ponds, the largest of which are called Lake Wyman and Lake Boca Raton. From the junction with Hillsboro River the canal cuts across two bends and then follows the direction of the old river bed to Hillsboro Inlet, $3\frac{1}{4}$ miles below the first crossing. The canal between the lake and river presents no difficulties, although at places it is quite crooked; through Lake Wyman the channel is indicated by clumps of mangrove on each side, and across the other lakes by spoil banks and stakes. A drawbridge crosses the canal about $\frac{1}{2}$ mile from Lake Worth and another about 4 miles farther south; both are tended. In the wider part of Hillsboro River a channel has been dredged along the western side, leaving a submerged ridge along the center. The least channel depth found in the river and canal was $4\frac{1}{2}$ feet; the bottom and sides are hard sand and rock.

Entering Lake Boca Raton from the north, turn sharply southward and follow the western shore until the canal opens. At Hillsboro

River hold southward through two short cuts to the old river bed, below a couple of eastward bends. Take the next bends at slow speed, turning carefully to keep the propeller clear of the rocky sides of the channel. When the river widens, about $1\frac{1}{2}$ miles from the lighthouse, keep close to the west bank to avoid a shoal ridge in midstream, and follow this shore past a lagoon with a spoil bank on the port side, and to the next narrow opening on that side.

Hillsboro Inlet lighthouse stands on the north side of the entrance to Hillsboro Inlet, which is very shallow and never used by strangers.

A canal and natural waterway extend about $9\frac{1}{2}$ miles south to New River Inlet; the passage is about of the same class as that north of Hillsboro Inlet and is good for a draft of 4 feet. A highway drawbridge crosses about 2 miles below Hillsboro Inlet.

After leaving the straight canal at a little pond, about $6\frac{1}{2}$ miles from Hillsboro Inlet, go slowly, keeping a sharp lookout for shoals. No directions can be given for avoiding them; but as the water is usually clear one can see them in time to sheer off if moving slowly. The channel generally favors the eastern side in the open waters extending $1\frac{1}{2}$ miles northward of New River Inlet.

Leave the little islet $\frac{3}{4}$ mile above the house of refuge, on the starboard hand and then haul off a little to avoid a shoal on the east side. Below this shoal keep close to the east side down to abreast of the house of refuge, on the north side of New River Inlet.

From a position close to the east shore a little below the house of refuge, cross over to the point on the southwest side, following the stakes. Then steer westward through the northern opening, passing northward of a wooded island and a small islet just beyond it. To go to Fort Lauderdale, continue along the north shore into the western branch, and then midchannel up this river. To go south, swing around the western end of the little islet (just above this opening is a small clump of mangroves in the river) and steer southward, across the channel on the south side of the islet, and follow the marsh southward at a distance of 50 to 100 feet to a well-defined mangrove point. Pass this point at a distance of 50 feet and then haul off a little and continue at a distance of 100 to 150 yards from the eastern shore. Near the lower end of this passage, which opens into Lake Mabel, a narrow channel has been dredged, leaving rocky shoals on each side. Stakes, if in place, mark this cut, but strangers should proceed with caution.

New River Inlet is 9 miles south of Hillsboro Inlet and lighthouse (measured along the seacoast) and is the only break in this coast between this lighthouse and the new entrance to Miami. The inlet is used by small local boats and by a few light-draft yachts, but is too shallow to be of any importance. In July, 1916, the inlet led directly into the eastern side of Lake Mabel, 1 mile south of the house of refuge, and had a depth of about $3\frac{1}{2}$ feet on the bar. The average rise and fall of tides is about $1\frac{1}{2}$ feet. Stranger should not attempt to enter, except under the most favorable conditions of a smooth sea and a rising tide; there are no pilots near the inlet. The depth across Lake Mabel from the inlet to the river leading westward to Fort Lauderdale is 3 feet, and thence 6 feet to Fort Lauderdale, $1\frac{1}{4}$ miles westward.

Fort Lauderdale is a small produce-shipping station on the railroad. Provisions, gasoline, and fresh water can be obtained here. There is

a repair shop for power boats and a marine railway of 30 tons capacity. Drawbridges cross the river above and below the town.

The river is said to be deep for a distance of 7 miles above Fort Lauderdale to the south drainage canal, which joins the canal from the Miami River to Lake Okeechobee. The north drainage canal enters this river about 1 mile above Fort Lauderdale and runs direct to the lake.

Waterway across Florida.—Boats of 3 feet draft at low-water stage (1916) can go from Fort Lauderdale through the North New River Drainage Canal to Lake Okeechobee, and this is the only navigable approach to Lake Okeechobee at the present time from the east coast of Florida. There is no navigable connection between Lake Okeechobee and the Gulf of Mexico at the present time, except for very small boats at high-water stage, although work is in progress to obtain a channel, navigable for boats of 4 feet draft, from Lake Okeechobee to the Gulf by way of Three-Mile Cut, Lake Hicpochee, Caloosahatchee Canal, Caloosahatchee River, and San Carlos Bay. Work is also in progress to obtain waterways for boats of this draft or greater to Lake Okeechobee from five points on the east coast of Florida.

NEW RIVER INLET TO MIAMI.

The distance is 23 miles and the least depth about 4 feet.

Lake Mabel is a circular lagoon across which a depth of about 4 feet can be carried at low water; the mean rise and fall of tides is about 1½ feet. From the cut and stake at the south end of the passage opening into the north end of Lake Mabel steer south-southeastward across the lake, following the stakes, to an opening at its south end. The old opening at the northeast end of Lake Mabel now opens directly into the ocean, and a new cut has been made from the south end of the lake southeastward to the south branch of New River. This cut is plainly marked by the spoil banks. From its outlet follow the south branch of New River southward for ¾ mile to the entrance of the last canal on this coast, marked on the north side by a white house. The mean rise and fall of tides here is said to be 2½ feet, and there are tidal currents of 2 knots at strength.

The canal is nearly straight for about 7 miles to Dumfounding Bay and has an average surface width of 40 feet and depth of 4 feet and over at low water. About 1 mile southward from the entrance a small canal from Dania enters this canal through its western bank; a highway drawbridge crosses the river here, and a toll chain about 4 miles below.

Small stakes mark the passage across Dumfounding Bay. The direction across to the southern outlet is about 209° true (SSW ½ W mag.). The passage south of Dumfounding Bay is very crooked and requires careful steering to avoid the shoals at the bends. A few private stakes mark the crossing of Snake Creek (branches east and west), ¾ mile below Dumfounding Bay. Turn sharply to eastward when this creek is reached for ¼ mile, then to southward, entering a narrow opening. A little farther down there are two branches; take the western branch and follow the staked channel southward to Biscayne Bay. There are sometimes tidal currents of ½ to 1 knot in this creek.

Directions, north end of Biscayne Bay to Miami.—The channel was well marked in the shoal places, in July, 1916, by stakes; the channel is narrow and crooked in places and strangers must depend upon the stakes to keep in it. From the western side of the islet at the outlet into Biscayne Bay, the waterway gradually works off to about 200 yards from the eastern shore, and follows it southward for about $\frac{3}{4}$ mile; it then swings gradually westward, and crosses the bay to within about 100 yards of a point on the western side, and then favors the western side southwestward for about 2 miles, gradually working off to about $\frac{1}{4}$ mile from shore $1\frac{1}{2}$ miles below a creek on that side. Then steer about 175° true (S $\frac{1}{2}$ E mag.) for about 2 miles to the north end of a channel, dredged 5 feet deep and marked in 1916 by a slatted beacon on the east side at either end, and by small stakes on each side between. Go through this channel on a south-southwesterly course, with the Royal Palm Hotel (largest building at Miami) nearly ahead. A depth of 5 feet can be carried by continuing the course to the drawbridge, or about 6 feet by continuing the course for $\frac{3}{4}$ mile past the lower end of the dredged channel, then steering 181° true (S mag.) for $\frac{1}{2}$ mile, and then steering for the draw.

MIAMI AND VICINITY.

Miami is on the west shore of Key Biscayne Bay, 9 miles below its head and 7 miles above Cape Florida. It has some commercial importance and is a popular winter resort, and frequented by a large number of yachts in winter. It is on the Florida East Coast Railroad, which extends across the keys to Key West. Provisions, ship chandlery, coal, gasoline, and fresh water can be obtained here. There are good facilities for repairing hulls and machinery of small craft and several small marine railways, at the largest of which vessels of 200 tons and 8 feet draft can be hauled. Storm warnings are displayed from a tower on the water front near Twelfth Street and are visible from the bay.

Small craft usually anchor off the ends of the wharves on the eastern side of the city, between them and the piles marking the main channel from southward, in a depth of 6 feet. There is 11 feet at the railroad wharf, near the upper end of the water front, and 4 to 5 feet at the wharves from the clubhouse dock southward to the southerly wharf on the east side of the city (in front of yellow buildings). There is a depth of 5 feet at the hotel wharf, on the north side of Miami River just inside its mouth, and at the wharves just above it, and 6 to 8 feet at some of the other wharves in Miami River. There are no public wharves at present, but there are several private wharves where boats may lie by paying wharfage, although during the winter berths for small craft are often engaged for a considerable time in advance, and are said to be difficult to find.

The mean rise and fall of tides at Miami is 1.1 feet.

Miami River trends westward, through the southern part of the city of Miami, to the Everglades and is navigable for a draft of 6 feet to the drainage canal, about 3 miles above its mouth. The drainage canal leading to Lake Okeechobee from Miami is navigable with difficulty for very small craft only at the present time. For

further information concerning the waterway across Florida see page 80. Three drawbridges cross the river, to the lowest of which a draft of 8 feet can be carried. The main entrance is from well southward of the city and is marked by piles on both sides. To enter the river from the main ship channel, bring the eastern wing of the Royal Palm Hotel to bear 336° true (NNW $\frac{1}{4}$ W mag.) and steer for it until the river opens fair. A depth of $3\frac{1}{2}$ feet can be taken into the river from northward by following the main water front of Miami, passing outside of a dolphin marking a sewer outlet, and inside of a small island.

The bay in front of and just south of Miami is very shallow, except where channels have been dredged. One channel leads from the deeper water south of the city to a turning basin at the railroad wharf and another from a new cut north of Norris Cut; both are marked by piles and beacons.

Channel south of Cape Florida.—Vessels up to 10 feet draft can come to the railroad wharf at Miami through a channel between the shoals south of Cape Florida to Key Biscayne Bay, thence up the bay to a dredged channel leading to the wharf. This channel is well marked by beacons and buoys.

The following directions are good for a draft of 8 feet to Miami; a draft of about 10 feet can be taken to the city, but requires local knowledge. The partly dredged channel from Cape Florida Shoal light through Biscayne Channel is marked on the starboard hand by piles with triangular day marks and buoys, and on the port hand by piles with square day marks. At times the currents have considerable velocity and require some attention.

Vessels can follow Hawk Channel to the perpendicularly striped buoy off the entrance; or, from outside, pass close to the bell buoy $2\frac{3}{8}$ miles northward of Fowey Rocks lighthouse and steer 288° true (WNW $\frac{1}{2}$ W mag.) for Cape Florida Shoal light (red house on piles) in range with Biscayne Channel light (red slatted structure on piles). Pass about 50 yards westward of Cape Florida Shoal light and haul a little northward, keeping in the channel marked by the beacons and buoys until up to Biscayne Channel.

The course through Biscayne Channel is about 271° true (W mag.) with Biscayne Channel light (red structure) a little on the starboard hand. Leave the light about 200 feet on the starboard hand, and then steer 310° true (NW $\frac{1}{2}$ W mag.), leaving the beacons on the sides indicated by their day marks, for $\frac{5}{8}$ mile until up to a beacon with a square day mark.

From this beacon steer 4° true (N $\frac{1}{4}$ E mag.) for $2\frac{3}{4}$ miles, passing $\frac{1}{4}$ mile eastward of a beacon with square day mark and to a position $\frac{1}{4}$ mile westward of a red buoy; and then steer 7° true (N $\frac{1}{2}$ E mag.) for $1\frac{3}{4}$ miles to the beacon at the entrance of the dredged channel. Then follow the dredged channel as marked by the piles (with day marks) to the turning basin in front of the railroad wharf.

Channel to Miami from eastward.—Boats can also come to Miami from outside through a cut, having jetties on each side, $\frac{1}{2}$ mile north of Norris Cut and 3 miles about east by south (mag.) from Miami. The buildings on the north side of the cut and the radio towers, about $2\frac{1}{2}$ miles north of it, are prominent. The outer end of the north jetty was submerged July,

1916, there was a depth of about 12 feet in a narrow crooked channel on the bar, but the best water did not lead midway between the jetties, and the channel was used only by small craft. The old dredged channel, leading from the entrance westward and northwestward to the city, had a depth of about 7 feet, and was marked in 1916 by barrels and stakes on the north side.

In July, 1916, work was in progress, by the city of Miami, to dredge a channel 18 feet deep from this entrance west-northwestward to the north end of the city where municipal wharves were being constructed. The dredged material was being deposited on the north side of the cut to form a causeway, through which there is to be a drawbridge at each end. A project to dredge a channel at Government expense, 20 feet deep and 200 feet wide, between the jetties, to connect with the channel being dredged to Miami, has been approved and preparations for starting the work were being made in July, 1916.

MIAMI TO KEY WEST.

The passage inside the reefs east and south of the Florida Keys from Fowey Rocks, at the entrance to Miami, to Key West is known as Hawk Channel. It is navigable for a draft of 10 feet and is well marked by beacons and buoys. The passage is protected, except at a few places, by offshore reefs, and is comparatively smooth in ordinary weather. The distance from Miami to Key West by this channel is about 136 miles.

Vessels drawing less than 5 feet can go west and north of the keys to Bahia Honda Harbor, and from there either through Hawk Channel or by way of the Gulf to Key West. This route is through smooth waters, and is well suited to small craft. It leads through a series of small sounds and protected bays from 6 to 10 feet deep, separated by coral reefs, through which narrow channels have been cut to a depth of 5 feet. The cuts are marked by piles or stakes, which, however, are not easily seen until close-to; but the reefs show clearly and are easily avoided. The stakes marking the cuts in 1916 were of a temporary character, and may be down at any time. Strangers should not depend on carrying a greater draft than 4 feet by this passage and with this draft some difficulty may be experienced in places in finding the openings through the reefs.

The mean rise and fall of tides is from 1 foot to 1½ feet along these keys; and there are strong tidal currents through the passages between the keys. The distance from Miami to Bahia Honda Harbor, by the inside passage, is 100 miles; from Bahia Honda Harbor to Key West, by the Hawk Channel, 33 miles; and from Bahia Honda Harbor to Key West, by Big Spanish Key Channel, Gulf of Mexico, and Northwest Channel, 49 miles.

Pilots for Hawk Channel and for the passage north of the keys can usually be found at Miami. Anchorages, sheltered from all ordinary weather, may be found anywhere along these passages, in the lee of the keys and reefs. Charts 166 to 169, inclusive, are the best guides.

Directions for the passage north of the keys.—The courses given here, if made good, will lead to the cuts through the reefs; but one must take into account cross currents, which, near the openings between keys, are often quite strong. During flood tide the current sets

through from Hawk Channel and in the opposite direction during ebb tide.

From Miami take the ship channel southward for $1\frac{1}{2}$ miles through the dredged channel marked by piles, and from the last one steer 187° true (S $\frac{1}{2}$ W mag.) for 12 miles to a position $\frac{1}{4}$ mile eastward of a pile marking the northeast end of Featherbed Bank; this course leads midway between a red buoy and a beacon westward of it and close to a beacon $2\frac{1}{2}$ miles beyond the buoy; on the latter half of this course Soldier Key (marked by house and a few trees) and Fowey Rocks lighthouse are the only prominent marks to seaward. Continue the course for $\frac{3}{4}$ mile beyond the pile, and then haul southwestward so as to pass westward of a pile marking the western end of the reef $\frac{1}{2}$ mile southward of Featherbed Bank; then steer 195° true (S by W $\frac{1}{4}$ W mag.) for $7\frac{3}{4}$ miles to a cut, 5 feet deep, through the shoal extending from Totten Key to Arsenicker Keys. This cut is about 1 mile long, has a 214° true (SSW $\frac{7}{8}$ W mag.) direction and was marked by stakes in 1916.

From the southern end of this cut there are two routes to the southwest side of Barnes Sound, both said to have a depth of about 5 feet. One route leads 209° true (SSW $\frac{1}{2}$ W mag.) for $5\frac{1}{2}$ miles to the most easterly of several creeks connecting the southwest end of Card Sound with Barnes Sound, through this creek (usually marked at each end by small private stakes), and then 210° true (SSW $\frac{1}{2}$ W mag.) for $4\frac{1}{4}$ miles to Jewfish Creek, leading into Blackwater Sound.

The other route leads from the southern of the cut in Card Sound, 228° true (SW $\frac{1}{8}$ W mag.) for $4\frac{3}{4}$ miles to a cut, 5 feet deep, near Card Point; it was marked in 1916 by stakes; there is a blind passage opening into its western side. After leaving this cut steer 213° true (SSW $\frac{3}{4}$ W mag.) for $1\frac{1}{2}$ miles to a cut close under the mangrove point on the port hand, marked by a clump of mangroves off the end. This cut, 5 feet deep, is marked by small stakes on both sides and leads into Barnes Sound. Then cross Barnes Sound on a 193° true (S by W mag.) course for 5 miles to Jewfish Creek, leading into Blackwater Sound.

The passage through Jewfish Creek is marked by small stakes and is crossed by a drawbridge. Keep to port at all openings. From Jewfish Creek steer 221° true (SW $\frac{1}{2}$ S mag.) for $2\frac{3}{4}$ miles to a passage eastward of Bush Point, leading into Tarpon Basin. On entering Tarpon Basin haul sharply westward, avoiding the southeastern end; then head for the west corner of the basin, keeping close to the southern shore when up to the passage out. The southeast end of Tarpon Basin is shallow, and there is a shoal at the west end, on the north side of the channel to the outlet.

When clear of the passage out of Tarpon Basin steer 215° true (SW by S mag.) for the cut through the mangroves, about 2 miles distant. On leaving this cut look out for a shoal on the starboard hand, and hold down 100 yards from the opening before turning; then steer 231° true (SW $\frac{3}{8}$ W mag.) for Pigeon Key, passing a rock awash and marked by a stake in 1916, 200 yards on the port hand and a shoal about the same distance on the starboard hand. Circle north and west, half around Pigeon Key, at a distance of 500 yards from it, and then steer 176° true (S $\frac{1}{2}$ E mag.) for the west side of Hammer Point.

Haul slowly westward to pass 400 yards northwest of Hammer Point and between it and a small stake about 600 yards northwest of the point, and then steer for a cut 1 mile west-southwest of Hammer Point. This cut was marked in 1916 by small stakes on each side, visible at a short distance only. From this cut steer about 241° true (SW by W $\frac{1}{4}$ W mag.) to pass, close-to on the port hand, a pile close to a mangrove point, $\frac{3}{4}$ mile distant; and then steer about 218° true (SW $\frac{3}{4}$ S mag.) for another cut, $\frac{3}{4}$ mile farther. The last cut is through a clump of mangroves, which line each side of the passage; there is a scattered clump of mangrove bushes farther north.

There are two openings through the next reef, extending northward from Shell Key. The southerly one is the one said to be used by local boats, although the course leading to it leads close to shoal reefs on either side, usually marked by stakes and showing discolored at all times. Strangers should proceed with caution.

To go through the southerly opening, from the cut through the mangroves, steer 241° true (SW by W $\frac{1}{4}$ W mag.) for $4\frac{1}{4}$ miles to a position south of a 1-foot rock, marked in 1916 by a stake; then steer 224° true (SW $\frac{1}{4}$ S mag.) for 2 miles, passing close to shoal areas on either side, to the cut through a reef marked by stakes in 1916, and then 246° true (SW by W $\frac{3}{4}$ W mag.) for $3\frac{3}{4}$ miles to a cut 300 yards southeast of the southernmost of three little keys (Bowlegs Keys).

Or to go through the northern opening, from the mangrove cut steer 244° true (SW by W $\frac{1}{2}$ W mag.) for $2\frac{1}{4}$ miles and then 252° true (WSW $\frac{1}{4}$ W mag.) for $3\frac{1}{2}$ miles to the cut. At the change in course a small reef, awash at high tide, lies 400 yards on the starboard hand, and 2 miles farther a rock, marked by a pile, is 600 yards on the port hand. From this cut steer 228° true (SW $\frac{1}{8}$ W mag.) for $4\frac{3}{4}$ miles to a cut southeast of the southernmost of three little keys (Bowlegs Keys). This cut is well marked by stakes on each side, and the reefs here show so clearly that the passage could be found easily without stakes.

Long Key Fishing Camp is on the western end of Long Key and is reached by water from the north side of the keys. There are accommodations for fishermen at the camp and sheltered berths for a few small boats alongside the wharf. Fresh water and some gasoline can be had here during the winter season. A depth of 4 feet can be carried to the camp by steering, from the cut at Bowlegs Key, 226° true (SW mag.) for $4\frac{1}{2}$ miles to a pile marking the northern end of a shoal off the eastern end of Long Key and then following the shore of Long Key at a distance of $\frac{1}{4}$ mile to the camp; this is the course most often followed by boats bound to Long Key. Or, from the same cut, steer 240° true (SW by W $\frac{1}{8}$ W mag.) for 9 miles; thence 151° true (SSE $\frac{3}{4}$ E mag.) for 1 mile, past a beacon on the port hand, and then 114° true (ESE mag.) to the camp. The latter courses pass over a least depth of 5 feet.

Directions to Key West (continued).—From the cut near Bowlegs Key, local boats of 4 feet or less draft, bound beyond Long Key, usually follow the directions given above for a draft of 4 feet to Long Key, then pass through the marked opening between the reefs eastward of Channel Key, pass northward of the reef just westward of Channel Key, southward of the one $1\frac{3}{4}$ miles beyond,

and then follow the keys to Bahia Honda Harbor, keeping just outside of the shoals close to the keys and inside of Palmetto Bank and Bethel Bank. There are shoals close to this route, but they are usually marked by private stakes.

A greater draft (about 6 feet at low water) can be carried by keeping farther from the reefs, but this course also leads close to shoals in places. To follow this route, from the cut near Bowlegs Key, steer 240° true (SW by W $\frac{1}{8}$ W mag.) for 10 miles to a position 300 yards south of a reef awash at high tide; and watch out for shallow places on each side. At the end of this course the reef referred to will be recognized easily by discolored water. The next course is 252° true (WSW $\frac{1}{4}$ W mag.), but if the preceding course has not been made good it will be necessary to alter the last course to get through a reef 1 mile from the last. There are several passages through this reef, the most southern of which is marked by stakes, but possesses no other advantage over the northern passage; the color of the water is a sufficient guide to any of them.

Steer 252° true (WSW $\frac{1}{4}$ W mag.) for 12 miles to a position 500 yards southeast of Crescent Shoal (bare at high tide); then 230° true (SW $\frac{1}{4}$ W mag.) for $1\frac{3}{4}$ miles to Bethel Bank, the most southern of several dry ridges. Follow along the north side of the bank at a distance of 300 yards, and from the west end steer 240° true (SW by W $\frac{1}{8}$ W mag.) for $4\frac{1}{4}$ miles, across Moser Channel, to a position 300 yards north of a sand spit extending northward from the railroad. Moser Channel leads to a drawbridge, which offers the last opportunity for a masted vessel 22 feet high to get into Hawk Channel. From the last position steer 247° true (SW by W $\frac{3}{4}$ W mag.) for $4\frac{3}{4}$ miles to Bahia Honda Harbor.

Westward of Bahia Honda Harbor there is no sheltered passage practicable for a stranger. Local boats of $2\frac{1}{2}$ feet draft find passages between the keys, but a stranger would be almost certain of getting aground. A stranger may either pass under the railroad bridge, which here has a clear headroom of $21\frac{1}{2}$ feet above mean high water, and continue by way of Hawk Channel; or he may enter the Gulf through Big Spanish Key Channel and proceed northward of the keys. The choice of the two routes depends upon the direction of the wind and sea. The distance to Key West by way of the Gulf is 49 miles, and by way of Hawk Channel 33 miles.

Directions from Bahia Honda Harbor to Key West Harbor—By Hawk Channel.—Pass under the railroad between any of the central piers. All spans have clear headroom (from the lowest part of the girders) of $21\frac{1}{2}$ feet at mean high tide or 23 feet at mean low tide. Tidal currents attain a velocity of 3 to 4 knots through these openings at certain stages of the tide; flood tide sets northward and ebb tide southward. From the railroad steer 176° true (S $\frac{1}{2}$ E mag.) for 1 mile, and then steer 241° true (SW by W $\frac{1}{4}$ W mag.) for $3\frac{1}{2}$ miles. Then steer 258° true (WSW $\frac{3}{4}$ W mag.) for 24 miles, leaving Loggerhead Key red buoy about $\frac{3}{8}$ mile on the starboard hand, Nine-Foot Shoal light (red and black, white light) 150 yards on the port hand, black buoy No. 17 about $\frac{3}{8}$ mile on the port hand, black buoy No. 19 P-K about $\frac{1}{8}$ mile on the port hand, and to the fairway buoy southeast of Key West. Then steer 289° true (WNW $\frac{1}{2}$ W mag.) to red gas buoy No. 6, and from there to red buoy No. 8 and into Key West Harbor.

By Big Spanish Key Channel and Gulf of Mexico.—Big Spanish Key Channel trends northwestward from Bahia Honda Harbor for about 8 miles, then northward for 4 miles, along the west side of Big Spanish Key and a shoal extending north from this key, to the Gulf of Mexico. The minimum depth is 5 feet, which is about 1 mile south of Big Spanish Key. Stand up Bahia Honda Harbor on a 339° true (NNW mag.) course until a 317° true (NW mag.) course can be laid so as to pass 400 yards northeastward of No Name Key, the large key on the northwest side of the harbor. Then steer 317° true (NW mag.) for a distance of $3\frac{1}{2}$ miles beyond the northeastern point of No Name Key to a position midway between Mayo and Crawl Keys (Mayo is the second key on the port hand above No Name, and Crawl Key is the next north of Mayo).

Then steer 305° true (NW by W mag.) for $2\frac{1}{2}$ miles and then 317° true (NW mag.) for nearly a mile, until up to the shallow water south of Big Spanish Key. Here the channel is usually marked by small stakes with white finger boards pointing to the best water. The channel curves northward close to the west side of a shoal surrounding Big Spanish Key. Then haul slowly to 339° true (NNW mag.) so as to bring the center of Big Spanish Key right astern, and steer this course into the Gulf. After clearing the shallow waters north of Harbor Key, steer 245° true (SW by W $\frac{1}{2}$ W mag.) for about 28 miles to the entrance bell buoy of Northwest Channel, and be guided by the buoys into Key West Harbor.

Key West is the terminus of the Florida East Coast Railroad and is connected by steamship lines with New York, Tampa, Mobile, Galveston, and Habana. The harbor is west and north of the city, which is on the west end of the island, and is navigable for deep-draft vessels. The anchorage is due west of the city; and north of it, in a pocket between the shoals, known as Man of War Harbor. The wharves along the west side of the city belong to the Navy Department and Lighthouse Service; north of which are the commercial wharves, along the northwest and north sides of the city; the railroad wharf is the most northerly of all. Large vessels may go to most of these wharves; and at the head of the slips and in the cove south of the railroad wharf are convenient berths for small craft.

Provisions, ship chandlery, coal, gasoline, and fresh water can be had here. The facilities for making repairs to hulls and machinery of vessels are good, and there are marine railways for hauling out vessels up to about 1,000 tons.

Storm warnings are displayed from a tower in Key West and at Sand Key.



APPENDIX.

LIST OF THE MOST NECESSARY CHARTS AND OTHER PUBLICATIONS COVERING THE INLAND WATERWAYS.

New York to Delaware River:

Chart 369. New York Bay and Harbor, price \$0.75.

Chart 375. Raritan River, price \$0.50.

Charts 296, 295, 294. Delaware River, price of each \$0.50.

Chesapeake Bay to Neuse River:

Charts 77 and 78. Chesapeake Bay in two sheets, price of each \$0.50.

Charts 1226, 1225, 1224, 1223, 1222. Chesapeake Bay in five sheets, price of each \$0.50.

Charts 77 and 78 can be used in place of these charts—for through courses—in Chesapeake Bay.

Chart 451. Southern Branch of Elizabeth River, price \$0.30.

Chart 1227. Norfolk to Albemarle Sound, price \$0.50.

Charts 1228, 1229, 1232, 1231. Albemarle and Pamlico Sounds, price of each \$0.50.

Chart 4:1, needed only by boats bound through Core Sound, price \$0.20.

Beaufort Harbor to Winyah Bay:

Charts 147, 148, 150, 151, 152, price of each \$0.50.

Charts 147 and 150 show Beaufort Harbor and Cape Fear River, and with these exceptions Chart 1110—Cape Hatteras to Charleston, price \$0.50—can be used in place of these charts for coasting.

Winyah Bay to St. Johns River:

Charts 153, 154, 155, 156, 157, and part of 158, price of each \$0.50.

Chart 577, Fernandina to Jacksonville, price \$0.50, is recommended for the passage from Fernandina to St. Johns River and for going up to Jacksonville.

St. Johns River to Miami:

Charts 158, 159, 160, 161, 162, 163, 164, 165, price of each \$0.50.

Miami to Key West:

Charts 166, 167, 168, 169, price of each \$0.50.

The route is covered in the following publications:

Inside Route Pilot, New York to Key West, price \$0.20.

U. S. Coast Pilot, Section C, Sandy Hook to Cape Henry (New York to Norfolk only), price \$0.50.

U. S. Coast Pilot, Section D, Cape Henry to Key West (Norfolk to Key West only), price \$0.50.

Tide Tables, Atlantic Coast ports of the United States (tidal information only), price \$0.15.

The following publications of the Bureau of Lighthouses describe the aids to navigation, and can be obtained free of charge on application to the Division of Publications, Department of Commerce, Washington, D. C.:

List of Lights and Fog Signals, Atlantic and Gulf Coasts of the United States.

Lists of Buoys and other Aids to Navigation for the following lighthouse districts:

Third District, Narragansett Bay to Cape May, including Long Island Sound, New York Harbor and tributaries.

Fourth District, Delaware Bay and River.

Fifth District, Cape Henlopen to Cape Lookout, including Chesapeake Bay and North Carolina Sounds.

Sixth District, Coast and Tributaries from New River Inlet, N. C., to Hillsboro Inlet, Fla.

Seventh District, Florida Reefs and Gulf Coast to Cedar Keys.

A catalogue showing additional charts, principally of the harbors along the route, can be obtained free of charge on application to the Coast and Geodetic Survey, Washington, D. C., or to any of its agents. A list of agents for the sale of charts and other publications of the Coast and Geodetic Survey is given in the catalogue, and also in the first notice each month of the Notice to Mariners, published weekly by the Bureau of Lighthouses and the Coast and Geodetic Survey.

COAST PILOTS OF THE COAST AND GEODETIC SURVEY.

	Price.
U. S. Coast Pilot, Atlantic Coast, Parts I-II, from St. Croix River to Cape Ann-----	\$0.50
U. S. Coast Pilot, Atlantic Coast, Part III, from Cape Ann to Point Judith-----	.50
U. S. Coast Pilot, Atlantic Coast, Part IV, from Point Judith to New York, including Long Island Sound-----	.50
U. S. Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays-----	.50
U. S. Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West-----	.50
U. S. Coast Pilot, Atlantic Coast, Section E, Gulf of Mexico, from Key West to the Rio Grande-----	.50
Inside Route Pilot, Coast of New Jersey-----	.20
Inside Route Pilot, New York to Key West-----	.20
Inside Route Pilot, Key West to New Orleans-----	.20
U. S. Coast Pilot, Pacific Coast, California, Oregon, and Washington-----	.50
U. S. Coast Pilot, Pacific Coast, Alaska, Part I, from Dixon Entrance to Yakutat Bay-----	.50
U. S. Coast Pilot, Pacific Coast, Alaska, Part II, Yakutat Bay to Arctic Ocean; replaces Coast Pilot Notes from Yakutat Bay to Cook Inlet and Shelikof Strait, and Coast Pilot Notes on Bering Sea and Arctic Ocean-----	.50
U. S. Coast Pilot, West Indies, Porto Rico-----	.50
Coast Pilot Notes on Hawaiian Islands-----	Free.

SAILING DIRECTIONS, PHILIPPINE ISLANDS.

Section I. North and west coasts of Luzon and adjacent islands-----	Free.
Section II. Southwest and south coasts of Luzon and adjacent islands-----	Free.
Section III. Coasts of Panay, Negros, Cebu, and adjacent islands-----	Free.
Section IV. Coasts of Samar and Leyte and the east coast of Luzon-----	Free.
Section V. Coasts of Mindanao and adjacent islands-----	Free.
Sections VI and VII. Mindoro Strait, Palawan Island, and Sulu Sea and Archipelago-----	Free.

I N D E X.

A.	Page.	Page.	
Adams Creek and canal.....	25	Coosaw River.....	53
Albemarie and Chesapeake Canal.....	19	Core Creek.....	25
Albemarie Sound.....	22	Core Sound.....	25, 34
Alligator Creek.....	46	Corncake Inlet.....	40
Altamaha Sound to St. Simon Sound.....	62	Cornfield Harbor.....	10
Arthur Kill.....	6	Cove, The.....	48
B.	Page.	Page.	
Back Bay.....	20	Croatan Sound.....	22
Back Creek.....	9	Cumberland River.....	64
Back River.....	63	Cumberland Sound.....	65
Bahia Honda Harbor.....	86	Currituck.....	20
Bear Inlet.....	38	Currituck Sound.....	20
Bear River.....	59		
Beaufort, N. C.....	26	D.	
Beaufort Entrance to Cape Fear River.....	35	Dawho River.....	51
Beaufort Harbor, N. C.....	26	Daytona.....	72
Beaufort, S. C.....	54	Deep Creek.....	21
Beaufort River, S. C.....	54	Deweese Creek.....	48
Bogue Inlet.....	38	Delaware City.....	9
Bogue Sound.....	36	Delaware and Raritan Canal.....	7
Bordentown.....	7	Delaware River.....	8
Bound Brook.....	7	Directions:	
Brickyard Creek.....	53	Adams Creek to Core Creek.....	33
Brown Inlet.....	38	Albemarie and Chesapeake Canal route.....	27
Brunswick.....	63	Altamaha Sound to St. Simon Sound.....	62
Bull Narrows.....	47	Back Creek and Elk River.....	15
Fullyard Sound.....	48	Bahia Honda Harbor to Key West.....	86
Buttermilk Sound.....	62	Baltimore to Sandy Point.....	16
C.	Page.	Beaufort Harbor.....	26, 84
Calbogue Sound.....	57	Beaufort to Cape Fear (out- side).....	40
Canal regulations:		Biscayne Bay.....	81
Albemarie and Chesapeake Canal	19	Bordentown to Florence.....	13
Chesapeake and Delaware Canal	9	Cape Fear to Winyah Bay (out- side).....	44
Delaware and Raritan Canal	8	Charleston to St. Helena Sound.....	49
Caloosahatchee River and Canal.....	80	Chesapeake Bay.....	16
Cape Fear River.....	41	Chester to Delaware City.....	14
Cape Fear Swash.....	40	Core Sound.....	84
Cape Fear to Winyah Bay.....	41	Croatan Lighthouse to Beau- fort.....	82
Cape Romain Harbor.....	46	Cumberland Sound to St. Johns River.....	65
Charleston.....	49	Dismal Swamp Canal route.....	30
Charleston to St. Helena Sound.....	49	Doboy Sound to Altamaha Sound.....	61
Chesapeake Bay.....	10	Elizabeth City to Croatan Light- house.....	81
Chesapeake and Delaware Canal.....	9	Elizabeth River, Southern Branch.....	27
Church Flats.....	50	Indian River.....	74
Clubs Creek.....	63		
Coinjock.....	20		
Cocoa.....	74		
Conch Creek.....	48		
Cooper River.....	57		

Directions—Continued.	Page.	Page.	
Jupiter Inlet to New River Inlet	74	Florida Passage	59
Kill van Kull to South Amboy	11	Folly Island Channel	49
Lake Worth	78	Fort George River	66
Miami to Bahia Honda Harbor	83	Fort Lauderdale	79
Mosquito Inlet to St. Lucie Inlet	72	Fort Pierce	75
New River to Miami	80	Frederica River	62
New York to Norfolk	11	Front River	61
New York to South Amboy	12		
Norfolk to Beaufort	27	G.	
Norfolk to North Landing River	27	Georgetown	44
North Landing River to North River	29	Graham Creek	47
North River and Albemarle Sound	80	Grant	75
Ossabaw Sound to St. Catherine's Sound	59	Grant Island	75
Pamlico Sound	32	Gray Bay	48
Pasquotank River	31	Great Wicomico River	10
Philadelphia to Chester	14	Gunnisons Cut	66
Port Royal Sound to Savannah	56		
Raritan River to New Brunswick	12	H.	
Sandy Point to Norfolk	17	Halifax River	71
Sapelo Sound to Doboy Sound	61	Hamlin Creek	48
Savannah River to Ossabaw Sound	63	Hamlin Sound	48
St. Andrews Sound to Cumberland Sound	58	Hampton Roads	10
St. Augustine Inlet to Mosquito Inlet	70	Harbor River, Bull Bay	47
St. Catherine's Sound to Sapelo Sound	60	Harbor River, St. Helena Sound	55
St. Helena Sound to Port Royal Sound	53	Hatteras	24
St. Lucie Inlet to Jupiter Inlet	76	Hatteras Inlet	24
St. Simon Sound to St. Andrew Sound	63	Haulover, The	73
St. Johns River to St. Augustine Inlet	68	Hawk Channel	83
Turkey Point to Baltimore	16	Hillsboro Inlet	79
Turkey Point to Sandy Point direct	17	Hillsboro River	78
Winyah Bay	43	Hillsborough River	73
Winyah Bay to Charleston	44	Hobe Sound	77
Dismal Swamp Canal	21		
Doboy Island	61	I.	
Doboy Sound to Altamaha Sound	61	Indian River	74
Dumfounding Bay	80	Indian River Inlet	76
		Isle of Hope	59
		J.	
Eau Gallie	75	Jacksonville	67
Elizabeth City	22	Jekyl Creek	63
Elizabeth River	19	Jensen	76
F Elliott Cut	50	Johnsons Creek	60
Elk River	10	Jones Creek	42
Estherville-Minim Creek Canal	45	Jupiter Inlet	77
		Jupiter Inlet to New River Inlet	77
		Jupiter Sound	77
		K.	
Fenwick Island Cut	52	Key West	87
Fernandina	65	Kill van Kull	6
Fernandina to St. Johns River	65	Kingsley Creek	65
Five Fathom Creek	46	Kingston	7
		L.	
		Lake Hicpohee	80
		Lake Mabel	80
		Lake Okeechobee	80
		Lake Worth	77
		Lake Worth Creek and Canal	77
		Lake Worth Inlet	77

Page.	P.	Page.		
List of charts and other publications.....	89	Pablo Creek.....	68	
List of coast pilots.....	96	Palm Beach.....	78	
Little Mud River.....	62	Pamlico Sound.....	23, 32	
Little River Inlet.....	42	Pasquotank River.....	21	
Lockwoods Folly Inlet.....	42	Patuxent River.....	10	
Long Key Fishing Camp.....	85	Plantation Creek.....	63	
M.				
McClellanville.....	47	Pleasant Creek.....	45	
Mackay River.....	63	Port Royal.....	55	
Manteo.....	28	Port Royal Sound to Savannah.....	56	
Masonboro Inlet.....	39	Portsmouth.....	25	
Matanzas Inlet.....	70	Price Creek.....	47	
Matanzas River.....	70	Q.		
Mathews Creek.....	47	Queens Inlet.....	39	
Mayport.....	67	R.		
Melbourne.....	75	Ramshorn Creek.....	57	
Miami.....	81	Rappahannock River.....	10	
Miami to Key West.....	83	Raritan River.....	7	
Miami River.....	81	Rich Inlet.....	39	
Middleton Anchorage.....	24	Koanoke Marshes.....	22	
Millstone.....	7	Roanoke Sound.....	22	
Mobjack Bay.....	10	Romain River.....	46	
Morehead City.....	27	Royal Shoal Anchorage.....	25	
Mosquito Inlet.....	72	S.		
Mosquito Inlet to St. Lucie Inlet.....	72	St. Andrew Sound to Cumberland Sound.....	64	
Mosquito Lagoon.....	73	St. Augustine.....	70	
Mud River, S. C.....	57	St. Augustine Inlet.....	69	
Mud River, Ga.....	61	St. Augustine Inlet to Mosquito Inlet.....	70	
Munden.....	20	St. Catherines Sound to Sapelo Sound.....	60	
Myrtle Beach.....	42	St. Helena Sound.....	53	
N.			St. Helena Sound to Port Royal Sound.....	53
Nags Head.....	28	St. Johns River.....	67	
Nassau Sound.....	66	St. Johns River to Miami.....	67	
Neuse River.....	25	St. Lucie Inlet.....	76	
New Brunswick.....	7	St. Lucie Inlet to Jupiter Inlet.....	76	
New River Inlet, Fla.....	79	St. Simon Sound.....	62	
New River Inlet, N. C.....	88	St. Simon Sound to St. Andrew Sound.....	63	
New River Inlet to Cape Fear.....	39	Saltpond Creek.....	47	
New Smyrna.....	72	San Carlos Bay.....	80	
New Topsail Inlet.....	89	San Sebastian River.....	70	
New York.....	6	Santee Pass.....	47	
Newport River.....	25	Savannah.....	57	
Norfolk.....	18	Savannah to Brunswick.....	58	
North Inlet.....	42	Severn River.....	10	
North Landing River.....	20	Sewee Bay.....	47	
North Newport River.....	60	Shallowbag Bay.....	23	
North River, N. C.....	20	Shallotte Inlet.....	42	
North River, Ga.....	61	Sister Creek.....	66	
North Santee River.....	45	Six Mile Creek.....	45	
O.			Skidaway Narrows.....	59
Ocracoke.....	24	Skidaway River.....	58	
Ocracoke Inlet.....	24	South Amelia River.....	65	
Ogeechee River.....	59	South Edisto River.....	52	
Old Teakettle Creek.....	61			
Old Topsail Inlet.....	39			
Oregon Inlet.....	24			
Ormond.....	71			
Ossabaw Sound.....	59			
Owendaw Creek.....	47			

ANNUAL INCOME

35.2

34.5

33.8

33.1

32.4

31.7

31.0

30.3

29.6

28.9

28.2

27.5

